GE Healthcare

Senographe Essential Acquisition System

Operator Manual

CE 0459

5307915-3-8991EN
Revision 1

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X-ray Warning

WARNING

X-ray equipment is dangerous to both patient and operator unless measures of protection are strictly observed

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful x-ray beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to x-radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the Recommendations of the International Commission on Radiological Protection, contained in Annals Number 60 of the ICRP, and with applicable national standards and should have been trained in use of the equipment.

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Favorite links for Operators

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Chapter 1 Publication presentation

1 Applicability

This manual is provided for Senographe Essential system Operators.

The manual has been written to describe the use of the Senographe Essential system in its most complete configuration. If any of the options described in this manual are not included in your system, skip the corresponding chapter or sections.

See your GE Healthcare Representative for the options available with the Senographe Essential system.

2 How to use the manual

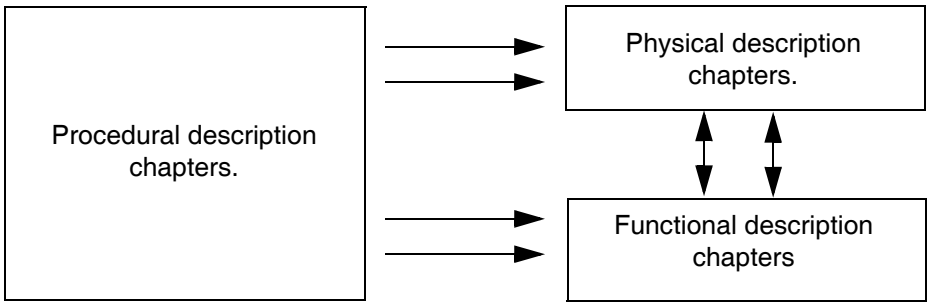
2-1 Chapter types

In general, information in this manual is arranged in *chapters*, each of which contains one type of information:

- *Physical description chapters*.
  Intended to answer the question: "*What is it ?*".
  Usually arranged according to physical location of the various parts.
- *Functional description chapters*.
  Intended to answer the question: "*How does the system behave?*".
- *Procedural description chapters*.
  Intended to answer the questions: "*How do I …?*", or "*What do I do now?*".
  Arranged according to context, i.e., according to the situation in which the Operator is operating, following the sequence of an examination.

2-2 Links between different chapters

Each type of information may refer to another. For example, a procedural chapter describing how to use a particular function may contain instructions which require the Operator to know how to find some piece of software or hardware (referring to a physical description), and to understand how the function works (referring to a functional description).



Chapters are arranged in an order which is intended to suit the learning requirements of a new Operator. This means that similar types of chapter are not necessarily grouped together.

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3 Conventions for this manual

3-1 Typographical

- In text describing the Operator interface, *italic* and bold characters are used to differentiate between body text and on-screen or hardware captions and labels, entered text, etc.:
  - Italics are used for references to hardware items and text which appears on-screen (e.g., menu titles, button labels, on-screen messages, etc.).
  - Bold face is used when specific instructions are given for the entry of text or selection of a menu option, etc. If the operation or text entry includes the use of a keyboard or mouse button, its name is shown between angle brackets, to distinguish it from entered text, e.g., 123<Enter> would be written for an instruction to type *123* followed by the *Enter* or *Return* key.
- In other text:
  - Italics are used when a specific concept is introduced.
  - Italic and bold characters may also be used for local emphasis.
  - In electronic version of the document, cross-references appear in blue italics.

3-2 Definitions of different types of Warnings

The various safety and cautionary notes throughout this manual are defined as follows:

Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

! Notice:
Used for instructions to the Operator to prevent damage to property.

Note:
Used to draw attention to information that is important for the Operator to know.

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4 Revision history

This table is intentionally left in English.

REFERENCE	DATE	REASON FOR CHANGE
5138581-1-100 Revision 1 Final release	May 04, 2006	Programme: Sirius. Product: Senographe Essential. Milestone ME3.
5138581-2-100 Revision 1A060511 draft	May 11, 2006	- Logs #70 to #188 from J.M.Sandrik added (file Seno-Essential_SiriusM3_OM-HII_form_060419_JMS.doc). - Logs from Richard Bertranine added (file Seno-Essential_SiriusM3_OM-HII_form_060419_bertrri.doc). - Layout and wording minor changes.
5138581-2-100 Revision 1A060516 draft	May 16, 2006	Addition of a Notice at the end of section 1-2 of chapter maintenance: - If it is necessary to use Cidex or other liquid disinfectant for the disinfection of compression carriage covers or sliding paddles, the liquid MUST NOT be applied directly to the equipment. Use it to lightly dampen a clean cloth, which may then be used to clean the equipment surfaces. Paddles must never be immersed in any liquid. If any liquid, and especially Cidex, is allowed to enter the compression carriage or sliding paddle mechanism, it may cause a malfunction. Take great care to avoid any possibility of liquid running into the equipment, for example around operating buttons and at the edges of moving parts. - Addition of paddles and image quality tools photos in chapter Accessories. - Improved photos in chapter Gantry (readout and footswitches). - Addition of a keyboard photo in chapter Control Station.
5138581-2-100 Revision 1A060522 draft	May 22, 2006	Addition of: - Marcia Hill + Robert Wisbey logs. See corresponding HII file. - Illustrations and text presentation improved.
5138581-2-100 Revision 1 Final release	July 12, 2006	Programme: Sirius. Product: Senographe Essential. Milestone M3. - Engineering answers applied (from Bill Conrad). See HII Seno_Essential-Sirius_OM_HII_Report_060529_FG.doc for full list. - Chapters "Startup & shutdown" and "User account & session management" are moved after "Initial training & set-up". - Chapters "Setting FOV size & position" and "View names" are swapped. - Chapter Maintenance: Slight restructuring to point out the risks of using liquid when cleaning or desinfecting the equipment, and differentiating parts in contact with patient from parts not having contact with patients. - Added cleaning instruction for keyboard and X-ray Console.

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REFERENCE	DATE	REASON FOR CHANGE
5195660-1-100 Revision 1	November 16, 2006	Product: Senographe Essential. Programme: Sirius. Technical Release: M3A_FB. - Engineering answers applied (from Bill Conrad). Logs that were not fixed at M3. See HII Seno-Essential_Sirius_OM-HII_Eng_replies_partial_060711_BC.doc for full list. - Chapter Maintenance: Restructuring of sections 1 and 2. Addition of two illustrations showing all parts that can be cleaned and/or disinfected. - Viewer and Printing chapters. References to FB views have been modified to reflect enhancements to film printouts introduced with AWS application software 41.01. - Incorporated information from OM Addendum 5195174-1-148.
5195660-2-1EN Revision 1	August 31, 2007	Product: Senographe Essential. Technical release: Sirius M43. Update of 5195660-1-1xx rev 1. Main changes with following topics: BO070123_DS&ESS_AUTODELETEFEATURE - Section "Autodelete" of chapter Browser, sub-chapTools menu utilities, 8-3 MedApp Prefs is improved, with following note: When the function is turned on, at least one of the profile buttons must be selected; if the disk system's used capacity reaches the Upper Threshold value*, the oldest exams are deleted by the system to make space for new ones, until the disk space reaches the Lower Threshold value*. Images which have been on the disk for less than the Miminum Storage time* are not deleted. * Values for Upper Threshold, Lower Threshold and Minimium Storage time have been adjusted by your Field Engineer at system installation, according to the workflow information you provided to him.Call you Field Engineer in case you want to modify those settings. BO070511_DS&ESS_PRINTMODEL - In chapter Printing, illustrations of Printing Models are replaced to reflect correct software operation. BO070713_DS&ESS_IHEMEDAPP - In chapter worklist / section 2 Image Acquisition / 2-1 Medical Procedure Card, the snapshot is updated to show " Implant present " check buttons. Explanation added. BO070717_DS&ESS_SPOTPADDLEWITHPV - In section Processing, a note is added after the existing notes as follows: Note: When acquiring images with Spot paddle in Mag mode or in Contact mode, the Premium View algorithm output may not be optimal. In this case, a satisfactory image display may be obtained by adjusting window level and window width.

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5195660-2-1EN Revision 1	August 31, 2007	BO061222_ESS_ROHS CHINESEREQUIREMENTS - In chapter 2, regulatory, page19, logo RhHS_label50 is added with description as follows : This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. BO070129_ESS_FOV_IMAGE-SIZE - In chapter 15 Setting FOV size and position, pages 101 to103, the following tables are updated : Table 1 FOV sizes ccording to their positions is added, Table 2 FOV sizes on the Gantry readout / image sizes in screen and film is replaced, Table 3 Initial FOV sizes and positions is replaced, Table 4 FOV sizes and positions according paddle types and posistions is added. BO070131_ESS_AUTOPRINT-PRINTERPROPERTIES - In chapitre 17 Browser, section 8.3.2:Text is improved. - Chapter 22 Printing, section 3-1 Auto PrintFilm size paragraph is corrected. BO070511_ESS_ANNOTATIONCONTENT - In Senographe Essential OM, chapter 20 Viewer, page 149, in section 3.1, item " sex " is aded after item "age". BO070823_AWS storage-capacity - Chapter "Specifications" - section 1-3 : AWS storage capacity updated to reflect ADS U20 computer technology.
	October 24, 2007	Litchi project - Sent to translation in EL, TR, HU, PL, RU, DA, FI, NL, NO, SV. Before sending to Litchi LocUI translations: - adding SW variables in Message to Operator chart , taken from Litchi subset catalogues - cleaning paragraphs and cross references according “Loc_Templates_071115_FM_Litchi”
5307915-2-899-1EN Revision 1	March 7, 2008	Introduction of AOP FlexDose feature GE Recomendation Note for AOP modified See Read Me for a detailed table of evolutions from the previous publication Draft submission for FDA Approval. (Rev 1A yymmdd Only) Chapter 16 Section 1: Introduction of AOP FlexDose feature. Chapter 16 Section 1: GE Recommendation Note for AOP Mode modified. Chapter 3 Section 6.2: GE Recommendation Note for AOP Mode modified. Chapter 6 before Section 1: Added generic header sentence to explain accessories are now **optional** or **basic** depending on country. Chapter 6 Sections 1.3, 2.2 and 6: Table of Accessories modified. Accessories are now **optional** or **basic** depending on country See Read Me for a detailed table of evolutions from the previous publication

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5307915-3-8991EN Revision 1	November 20, 2008	EnvironmentalRequirements - Heading 3-3 Ambient Light promoted Level by one. Renamed section 3 to Environmental Requirements Replaced section 3-1 and 3-2, with "environmental pressure limits", "operating requirements - temperature and humidity", and "short term shutdown requirements - temperature and humidity". Notes about transport/operation/storage in "environmental pressure limits" are no longer applicable to the OM. AOP mode for Stereotaxy Exams (AOP Stereo Configurable) - Chapter17 - Manual and AOP exposure modes Added Section 1-3 Usage of AOP Mode for Stereotaxy Exams containing a short description of AUTO mode. Modifications to distinguish between Stereotaxy and Non-Stereotaxy information. Chapter 19 - Worklist Modified Section 3-1 Buttons, Switches and Displays summary containing the description of kV and mAs readout display and AOP and manual mode selection button. System Hygiene - Created new Chapter 25 - System Hygiene Planned Maintenance Table update - Chapter 28 Planned Maintenance Section 1 Introduction Modified lead sentence - Chapter 28 Planned Maintenance Section 2 Changed Chapter heading to Planned Maintenance Added new entry in the table : Change AWS Motherboard battery (V3 Control Stations only)" with a period of 12 months Modified table subsections Control Station - UPS and, Acquisition Image Quality Regulatory Issues - Modified languages in Menu Tree - Removed Caution compression in AOP mode - Replaced Norme EN xxx by ISOxxx Certified - Modified scope of Environmental Specifications" Angle Unit - Chapter 15 FOV.fm. Updated Arm angles New BarCode Reader - Chapter 21 Viewer.fm. Repeat and Reject Analysis - Added phrase to clarify RRA option Additionalkey boards - "Chapter 7 Section 2-3: Added the phrase: Depending on the keyboard delivered with your system, the Caps Lock and Control keys may be inversed. Reworked the illustration to make the arrows clearer Added symbols to represent the Shift and Back Space Keys GantryReInitialiseAfterStop - Chapter 3, gantry.fm Modified section 1 page 21 and section 3 page 86

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REFERENCE	DATE	REASON FOR CHANGE
		Accessories_Optional_or_Standard - Resolved at ORION1. See 5307915-2-899-1EN Revision 1 BUCge88859, BUCge85343, EURge91462 Display thickness_ ESEAGD Chapter 10 Section 5 Added a new section for the following: - Dose display - Entrance Skin Exposure (ESE) - Average Glandular Dose (AGD) Also covers the following SPRs: - BUCge88859 - EURge85343 Detector fragile Chapter 3 Section 5 - reformat of paragraph structure Section 5-1 - Added a Notice Section 5-2 - Added a Notice Section 5-3 - Added a Notice Created a new Section 5-4 - Stereotactic Positioner Chapter 4 Section 4-2 added content Option List Changed 2: Acryllic Plates - Resolved at ORION1. See 5307915-2-899-1EN Revision 1 Cross reference error in Essential OM - section 3 on page 107 of 5307915-2-899-1EN. Fourth bullet point modified "table 4 changed to table 3" Copyright info_EURge22314 - Chapter 17 Section 8. Added new line, Copyright Info Modified Edit Patient to Edit Patient/Procedure This also affects the description on page 127. Bold and Italics corrected for list of Operator editable options Dose Calculation BUCge88859 and EURge85343 Chapter 13 Section 5.2.3 - Added a new section - Typos corrected. - Modification made to Note above 5-5-3. Also covers the following SPRs: - BUCge88859 - BUCge85343 - EURge91462 PV4 Chapter 18 (formally 17)- Browser Section 8-3-9 : - Added new content: Chapter 22 (formally 21) - Image processing and display - Added new content

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REFERENCE	DATE	REASON FOR CHANGE
		Back Cover Page - resolved at ORION 1. New back cover page BeepToRemove EURge90812 Chapter 11, Section 3-1 Access to set-up menus - Added phrase "Function currently unavailable: selection has no effect" to the Beep Menu function in illustration Annotation Level EURge74426 Chapter 20, Section 3-1 Annotation Content - Patient Information modified, removed ""sex, added Laterality and view name"" - Anatomical Information, removed Laterality and View name Chapter 20, Section 3-2 Annotation Level: - Modified the contents of the Custom Annotations Window for the following menu items: Patient Information and Anatomical Information AOPFlexDose Chapter 17 Section 1-4-1 AOP configuration at installation - Created TR variables for: Profile and Classic - Corrected content as requested in FDA Feedback NewPrintModels EURge91709 Chapter 22 (print.fm) - Changed all Print model images. - Corrected text in Print Model 2. - p180 and 182: Replaced image. - p181, 182 and 183: Removed the Caution "Annotations printed on film may overlap if they are too long..." Graphics and measurements EURge71024 Chapter 20 Section 3-3 Graphics and measurements: - Added the phrase: "In Review mode, you must select the graphical annotations added in acquisition mode in order to display the measurements". - Corrected grammatical error : "You can add several graphic annotations (line segments and ellipses) to the same image " Date Not Translated XRYGe31774 Chapter 18 Section 5 and Chapter 19 Section 2-2-1 - Created a translation correspondence table for months of the year Mirror Angle EURge71945 Chapter 3 Section 3-1-1-2 modified Image Review EURge92294 Chapter 20 - Viewer, Section 1-2 Mosaic Image Browser: - New note added - Corrected the Section Title Error Message table modifications Chapter 25 - Operator Messages, Table 1. Added: - I52 Detector calibration not optimum. Gain map calibration has not been performed. Contact Field Service Representative.

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REFERENCE	DATE	REASON FOR CHANGE
		Chapter 25 - Operator Messages, Table 5: added - W34 Automatic force reduction activated (high compression force). The maximal manual compression force has been reached. Stop the increase in compression force using manual compression. - W35 Automatic force reduction failed. Do not use high force. The maximal manual compression force has been reached. Stop the increase in compression force using manual compression. Try to reduce the compression force if possible. - Deleted Neph Mess 214 and 215 Chapter 26 Tables 1 and 2 - Deleted I07, S52, BB1, BB2, BB3, BB5 and BB7 Ch12_Login EURge68727, EURge78459 - Login information updated. Distinction made between Control Station (CS) V1/V2 and V3. Ch13_Administrative-EURge31108 - New Chapter to focus on CS V3 - Login information updated. Distinction made between Control Station (CS) V1/V2 and V3. AngleUnit_7x7 square mag pad - Chapter 6 Section 1-3. Removed 7 x 7 - Chapter 16 Section 3. Removed 7 x 7 - Chapter 26 Section 4-1. Removed 7 x 7 Spanish OM Only - The Spanish translation of "European registered place of business" needs to be replaced by "Representante autorizado en Europa" Chinese OM Only - Updated table of Hazardous substances

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Chapter 2 Regulatory requirements

1 Manufacturing requirements

This product complies with the regulatory requirements of the following:

- Council Directive 93/42/EEC concerning medical devices: the CE 0459 label affixed to the product testifies compliance to the Directive.

  European registered place of business:
  GE Medical Systems Société en Commandite Simple
  Quality Assurance Manager
  BP 34
  F 78533 BUC CEDEX France
  Tel: +33 (0)1 30 70 40 40
- Code of Federal Regulations Title 21, Subchapter J - Radiological health.
- Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.
- Canadian Standards Association (CSA).
- International Electrotechnical Commission (IEC), international standards organization, when applicable.

Compliance with these standards is evidenced by the presence of the appropriate labels on the exterior of the Generator cabinet.

- USA/HHS: United States Federal law restricts this device to use by or on the order of a physician.
- *General Electric Medical Systems SCS* is ISO 9001 and ISO 13485 certified.
- The original document was written in English.

Use within the patient environment

All components of the Senographe Essential system (Generator Cabinet, Gantry, Control Station) are designed to be suitable for use within the patient environment, and are compliant with the relevant standards (UL 2601, IEC 60601-1).

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2 Installation requirements

Packing materials

The materials used to pack our equipment are recyclable. They must be collected and processed in accordance with the regulations in force for the country where the machines or accessories are unpacked.

Use in the presence of flammable gases

The Senographe Essential system must not be used in the presence of flammable gases.

Electromagnetic Compatibility (EMC)

This equipment complies with IEC 60601-1-2 Edition 2 EMC standard for medical devices.

This equipment generates, uses, and can radiate radio frequency (RF) energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with radiated emissions as per CISPR11 Group 1 Class A standard limits.

Detailed requirements and recommendations about power supply distribution and installation are listed in the Pre-Installation section of the Service Documentation shipped with your system. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the Operator (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- reorient or relocate the affected device(s)
- increase the separation between the equipment and the affected device
- power the equipment from a source different from that of the affected device
- consult the point of purchase or your GE Healthcare Service Representative for further suggestions

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

All interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

Do not use devices which intentionally transmit RF Signals (Cellular Phones, Transceivers, or Radio Controlled Products) in the vicinity of this equipment as it may cause performance outside the published specifications. Recommended separation distances are detailed in the Pre-Installation section of the Service Documentation shipped with your system. Keep the power to these types of devices turned off when near this equipment.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to comply fully with the above requirement.

Further data and recommendations for meeting Electromagnetic Compatibility (EMC) requirements for a typical installation are given in the Pre-Installation section of the Service Documentation shipped with your system. Note that the magnetic field of an MRI device located nearby may cause a risk of interference. Magnetic field amplitude limits are specified in the Pre-Installation section of the Service Documentation shipped with your system.

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3 Usage requirements

Image annotations

- The equipment includes a function IMAGE ANNOTATIONS, which allows the physician to store information on the patient.
- Note that the European Directive regarding “the protection of the people with regard of data management on their private life and to the free circulation of these data”, requests the users of computerized files (radiologists, physicians) not to store data related to:
  - race
  - philosophical opinions
  - religious opinions
  - political opinions
  - etc.

4 De-Installation and Recycling requirements

Machines or accessories at end-of-life

The elimination of machines and accessories must be in accordance with national regulations for waste processing.

All materials and components that could pose a risk to the environment must be removed from the end-of-life machines and accessories (examples: dry and wet cell batteries, transformer oil, etc.).

Please consult your local GE Healthcare Representative before discarding these products.

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5 Meaning of symbols

Protective ground (earth)

Ground (earth)

Dangerous voltage

Type B equipment

This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 (Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products).

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Chapter 3 Safety recommendations

1 Introduction

Examinations performed regularly without problems are a mandatory process. All aspects of mammographic exams, and especially safety, must be optimized to ensure effective diagnosis and allow the development of screening programs.

Safety precautions and recommendations for the avoidance of potential hazards, and against misuse, are given throughout this document. They must be made known to, and be practised by, all Operators of the Senographe Essential system.

You are strongly recommended to keep this manual with the equipment at all times. Review it from time to time and be sure that you are familiar with all aspects of use of the equipment, and especially those affecting safety.

This chapter is intended to bring attention to and emphasize some of the more important of these precautions and recommendations.

Stop all examinations and call your GE Healthcare Service Representative immediately if you believe that the equipment is not operating correctly.

2 Potential adverse effects

The following is a list of potential hazards that apply to mammography and are also applicable to digital mammography using the Senographe Essential system:

- Injuries
  - Excessive breast compression,
  - Skin irritation, abrasions, or puncture wounds,
  - Infection.
- Irradiation
  - Excessive X-ray exposure.
- Electrocution
  - Electric shock.

3 System configuration

- No modifications to system hardware or software may be made without prior approval from GE Healthcare. GE Healthcare cannot guarantee the integrity of the system if this recommendation is not followed.

No application programs or software of any sort may be loaded onto the system computer without prior approval from GE Healthcare. GE Healthcare cannot guarantee the integrity of the system if this recommendation is not followed.

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4 Before starting an examination

4-1 Check the integrity of the system covers

- Check the integrity of the covers on the Arm, Column and Control Station. If any of these covers is damaged or detached, contact your GE Healthcare Service Representative to have it replaced.

4-2 Check the paddle, the Bucky and the magnification stand

- Check that the paddle and the Bucky or the magnification stand are clean and free from dust. Impurities on the surface of the paddle, Bucky and magnification stand may generate artifacts in captured images.
- Check that the Bucky or the magnification stand does not have any scratches or has not sustained any damage to its surface. Damage or scratches to the surface of the Bucky or the magnification stand may generate artifacts in captured images.
- Check that the compression paddle and the Bucky or magnification stand, are all well inserted in their supports, and are being used as recommended. If the Bucky is used, be sure that it is locked (not only inserted).
- Only accessories and components supplied by or specifically recommended by GE Healthcare may be used with the system. GE Healthcare cannot guarantee the integrity of the system if this recommendation is not followed.
- Only Senographe Essential system compression paddles may be used with the system. Use of other paddles may adversely affect image quality by causing inaccurate measurements of breast thickness (if another paddle is used, exposure is forbidden in all modes except in manual mode).
- All accessories must be checked regularly to ensure that they have no sharp edges or corners that might cut, pinch, or otherwise hurt a patient.

4-3 Damaged equipment

If equipment is damaged or fails, have it repaired immediately by authorized GE Healthcare service personnel, even if the damage or failure does not affect the functions you normally use. The damage or failure can result in a potentially serious patient safety hazard under other circumstances.

4-4 Damage to the Digital Detector

The digital detector contains thallium doped cesium iodide, a substance which requires special precautions for handling and recycling. If the protective casing of the digital detector sustains damage, please consult your GE Healthcare Service Representative.

If the digital detector casing is punctured, the detector must be removed by authorized GE Healthcare service personnel wearing protective gloves and dust masks.

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5 Operator protection against radiation

To avoid excessive exposure to radiation, Operators must remain behind suitable radiation shields whenever X-ray exposures are made.

It is mandatory that the X-ray Console used to control X-ray exposures be permanently mounted behind a radiation shield, in such a way that it can only be used by an Operator in the protected area. The Acquisition Workstation (AWS) controls are used during exposures, then they also must be installed in the protected area.

These requirements are met by the Senographe Essential Control Station, which includes a radiation shield (700 mm/25 inches wide; 0.3 mm lead equivalence shielding) and provides a suitable mounting position for the X-ray Console in the protected area. Other radiation shields are available if required to meet the requirements of local regulations or hospital working practices.

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6 When performing an examination

6-1 Check the patient

Before beginning the mammogram, observe the following points:

- Before positioning the patient, make a visual assessment of the breast area, and note anything which may affect or be adversely affected by the correct positioning of the breast for the mammogram, for example, warts, scarring, or skin which is not intact. In patients with large breasts, perspiration under the breast can cause the skin to soften, and become paper-thin.

  To position the breast properly for a mammogram in the Cranio-Caudal (CC) position, it is mandatory that the breast be lifted away from the chest wall and gently pulled forward, in order to visualize the maximum amount of breast tissue. Such pulling and lifting is necessary for correct positioning, but can cause damaged skin to tear slightly, and may cause bleeding.

  If any condition exists which may cause unusual discomfort or tearing of the skin, the patient should be told of the importance of correct positioning, and should be warned in advance of the possibility that minor tearing and /or slight bleeding might occur.
- Use suitable techniques for the positioning of patients with breast implants.

6-2 AOP mode

The Senographe Essential provides an AOP (Automatic Optimization of Parameters) operating mode. This mode is designed to optimize image quality for the examination of breasts with a compressed thickness between 10 mm (0.4 inch) and 80 mm (3.15 inches).

However, there are some types of examination for which manual selection of parameters may be more suitable. These are discussed in Chapter 10 *Examination steering guide*.

Note:

GE recommends that Standard (STD) and Dose (DOSE) modes be used for routine mammography. The Senographe DS Contrast (CNT) mode delivers more dose than Standard and Dose modes. GE recommends that Contrast mode be used only after consultation with an interpreting physician or radiologist.

Note:

To fulfill the requirements of certain countries, access to Contrast Mode can be restricted as described in the Service Documentation.

6-3 Residual images

Repeated exposures made with a high contrast object in the digital detector area may lead to the creation of a ghost image, caused by an excessive difference of residual charges between cells of the detector. The time taken for this ghost image to disappear depends upon the magnitude of the residual charges.

This effect can occur during checks to measure the X-ray field which use a dosimeter ionization chamber in the beam. To avoid it, use one of the following solutions:

- Reduce the contrast of the object by including it in a field protected by an X-ray attenuator of adequate thickness.
- Use the internal dose measurement facility.
- Protect the digital detector by means of a 3 mm steel plate for the duration of the measurements.

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6-4 Breast support temperature

- It is normal that the front part of the breast support is warm to the touch, as it contains electronic components that generate heat. However, the temperature is never high enough to be harmful.

  To ensure that examinations are carried out under optimum conditions, any unusual rise in temperature causes a warning message to be displayed on the AWS LCD monitor, forbidding examinations. Any further rise causes the detector system to be automatically shut down.
- GE Healthcare can take no responsibility for injury to the patient caused by the use of heating or warming devices external to the system.

6-5 Moveable components

The equipment includes a number of moveable components.

Users must be instructed to monitor all movements, and to take all due care and precautions when moving any part of the equipment in the vicinity of themselves or other persons.

To ensure safe operation at all times, the compression system is fitted with a magnetic braking mechanism, which prevents the compression paddle from falling in the event of power loss. If power loss does occur while a patient is under compression, the compression force remains unchanged. Disengage the patient by raising the paddle gently, using the manual compression knobs. See section *4 Compression carriage and Paddle holder assembly on page 40*.

To minimize potential injury to the patient in decompression mode, the upward movement of the compression paddle is stopped if a downward force greater than 3 daN is applied.

6-6 Emergency stop and shutdown

- Emergency stop switches are provided on both sides of the column, easily accessible to the Operator. See illustration in section *1 Gantry components on page 35*.

  Push either of these switches to immediately stop all positioner movement. Any compression which may have been applied to the patient remains unchanged; the patient must be released by using the manual compression knobs. See illustration in section *4 Compression carriage and Paddle holder assembly on page 40*.

  After use of one of these switches, the Operator must turn power off and on (from the X-ray Console) to restore normal use of the system.
- If an emergency arises which requires complete removal of power from all parts of the system, the mains isolator switch that supplies power to the system from the hospital supply must be switched off. Find out where this isolator is located and how to operate it.

  Note that all image and patient information being processed at the time of cutting power will be lost, and that power for the environmental control of the Digital Detector will be cut (this may entail a delay before the system can be brought back into use).

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7 Storage of acquired images

Images acquired during examinations are stored on an internal disk system for preliminary assessment, before permanent archiving or printing to film. The system is designed to avoid all foreseeable problems during the acquisition and storage operations. Precautions include continuous checks on all components and the provision of a battery-backed Uninterruptable Power Supply (UPS), to allow correct processing of images to be completed before shutdown in the event of a power failure.

Certain conditions may cause a loss in the ability of the system to acquire high quality images or a risk that images might not be correctly saved (for example, if the UPS batteries are not sufficiently charged to ensure correct shutdown). For these conditions a warning message appears on the AWS monitor and/or the X-ray Console. A list of possible error messages, with explanations and suggested actions, is given in Chapter 26 *Operator messages*.

You should note the following recommendations:

- Always follow the correct system shutdown procedure as described in Chapter 12 *Startup and shutdown*.
- In spite of the presence of the UPS, it is not advisable to switch off power while an image is being processed and stored.
- If defects or failures on the disk system are observed, ***call your GE Healthcare Service Representative***. It may be possible to recover information on the disk system if the damage is not too severe.

8 Archiving

CAUTION

The digital technology used by the Senographe Essential Control Station provides the ability to transfer acquired images between workstations, and to store them on a hard disk system. However, it is not intended or approved for use as an archiving device. Do NOT perform REPROCESSING of images acquired with the Senographe Essential, using another acquisition system, as this may result in artifacts due to incompatibility.

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Chapter 4 Product presentation

1 Overview

1-1 Senographe DS and Essential family

Senographe DS and Essential belong to the family of Digital Mammography Systems from GE Healthcare. They have been designed to perform Screening examinations as well as Diagnostic Views (including Spot compression, Magnified and/or Coned views). These systems eliminate the need for film cassettes, and takes advantage of digital technology, including on-screen image display, Networking, Filming, and Archiving.

The raw and processed images are available on the AWS LCD monitor within a few seconds after the exposure.

The Senographe Essential is a large Field Of View (FOV) system while the Senographe DS is a normal Field Of View system.

The Senographe Essential system has a larger detector which allows the examination of large breasts. The positioning of a small breast can be de-centered on the left side or the right side by adjusting the sliding paddles.

1-2 Indications for use

The Senographe Essential system is intended to be used in the same clinical applications as traditional mammographic film/screen systems. It generates digital mammographic images which can be used for screening and diagnosis of breast cancer.

2 System components

Control Station
(see Chapter 7 *Control Station*)

Generator Cabinet
(see Chapter 9 *Generator Cabinet*)

Gantry
(see Chapter 5 *Gantry*)

X-ray Console
(see Chapter 8 *X-Ray Console*)

System options (not shown): See section *3 System options on page 32*

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3 System options

System options available are listed below. See your GE Healthcare Representative for more information on accessories and options.

3-1 Networking

The Senographe Essential is DICOM (standard for Digital Imaging and Communication in Medecine) compliant, allowing it to be connected in a network with other compliant devices for the exchange of images. Networking allows transmission of images acquired with the Senographe Essential system to other DICOM-compatible review stations, using the “Network Push” function of the Browser. In some cases, detailed evaluations will be needed for the implementation of customized connections.

3-2 Review workstation

Example shown: Seno Advantage 2 review workstation.

- Short-term archiving.
- Images transfer to printer and network.

Provides interchange media archiving on CD-R, and DICOM archiving.

CAUTION

For softcopy diagnostic interpretation, images shall be reviewed on an approved Digital Imaging and Communications in Medicine (DICOM)-compatible review workstation with screens whose resolution are at least 5 Mpixels each.

3-2-1 Use of review workstations

CAUTION

Images acquired on the Senographe Essential are larger than the images produced by the Senographe 2000D and DS Acquisition Systems.Displaying or printing large images on a review workstation without the ability to handle them correctly may result in errors in object size evaluation and measurement.

Only GE Seno Advantage 2.0 workstations (software version SA2_03.1.5 or later) may be connected to Senographe Essential Acquisition Systems.

When using other GE Workstations (RWS and Seno Advantage 1.x) to display or print large Senographe Essential images users may misjudge the size of objects in the image, because the zoom factor may be different from one and is not annotated on the displayed or printed images.

Before using a non-GE review workstation, the user should contact the workstation provider and verify that the product is capable of correctly displaying and printing images generated by Senographe Essential with a zoom factor of one or alternately displaying the zoom factor on the image.

If you send images from the Senographe Essential by network or by CD for review on remote workstations, please advise your correspondents of this requirement.

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3-3 Mass archiving system

When this option is installed and connected to the Senographe Essential, acquired images can be sent to the mass archiving device for permanent storage, either automatically or on request. A list of all patients ever imaged on the Senographe Essential system can be kept on the mass archiving device, making future retrievals fast and easy.

3-4 Printer

To provide “hard copies” of images, the Senographe Essential system can be connected to a high resolution DICOM MG compatible printer for film printing.

WARNING

Only images produced by GE Healthcare-recommended printers can be used for final interpretation of examinations. for compatible printers see the latest product data sheet for this system, which may be obtained from your local GE Healthcare sales representative.

4 Senographe Essential accessories

Accessories delivered with the Senographe Essential and available as options are listed in Chapter 6 *Accessories*.

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Chapter 5 Gantry

1 Gantry components

The main components of the Gantry are shown below:

- **Emergency stop buttons:** There are two emergency stop buttons, one on each side of the Column. Press one of these buttons to immediately stop all Gantry movement. X-ray acquisition remains possible. After performing a Gantry emergency stop, you can reactivate movement on the Gantry by performing a Gantry reset (See section *Gantry reset on page 90*).
- **Column:** The Gantry Column is securely fixed to the floor. It supports the Arm and allows it be moved vertically.

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2 Gantry Arm

X-ray tube head
See *3 X-Ray tube head on page 37*

Arm movement control buttons
See *3-1 Arm movement control buttons on page 37*

Compression Carriage and Paddle holder
See *4 Compression carriage and Paddle holder assembly on page 40*

Handle

Interchangeable compression paddle
See *4-1 Interchangeable compression paddles on page 40*

Hand rest

Image Receptor
See *5 Image Receptor on page 43*

Magnification stand (Not shown)
See *5-5 Installing the breast support (Bucky or Magnification stand) on page 45*

- **Handle**
  The patient's hand may be positioned on the handle as required, for greater comfort and to optimize access to the breast, especially for lateral and oblique views.
- **Hand rest**
  The patient's hand may be positioned on the hand rest for comfort and to optimize access to the breast for CC views.

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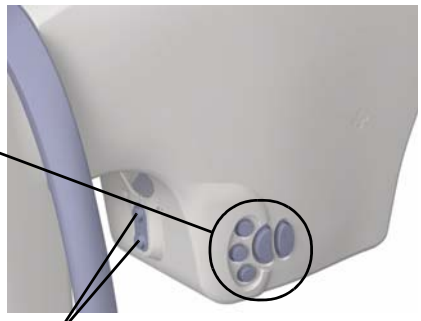
3 X-Ray tube head

The X-ray tube head contains the X-ray tube, the Collimator diaphragm, and the centering light. It provides the Collimator light and field of view (FOV) control buttons, as well as the Arm movement control buttons. The Face protection shield accessory can be fitted to it. See illustration below:

X-ray tube head side view

X-ray tube head rear view



Arm movement control buttons
See *3-1 Arm movement control buttons on page 37*

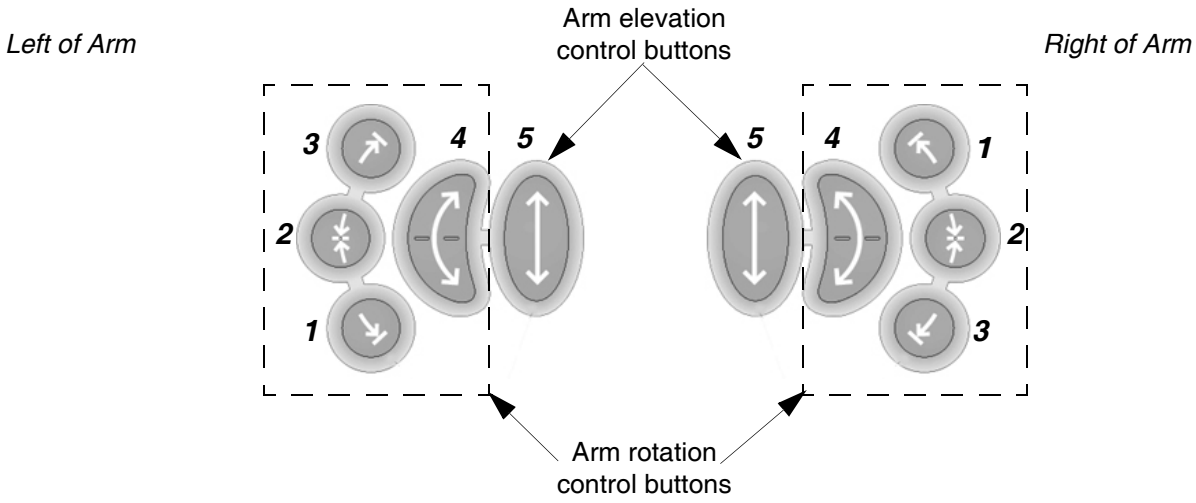
Collimator light and field of view (FOV) control buttons
See *3-2 Collimator light and FOV control buttons on page 39*

Face protection shield
See *3-3 Face protection shield on page 39*

2D Cross-hair device
See *3-4 2D Cross-hair device on page 39*

3-1 Arm movement control buttons

- **Arm movement control buttons**
  Four sets of five buttons are provided, one on each side of the X-ray tube head and one on each side at the base of the handle. They are all used in exactly the same way.



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3-1-1 Arm rotation control buttons (references 1, 2, 3 and 4 in the illustration)

3-1-1-1 Movement to any required position

- *Rotation control buttons*; reference 4. Use either right or left button 4 to rotate the Arm in the direction of the arrow.
  Press the top or bottom of the button gently to rotate the Arm in the direction indicated by the arrow at low speed.
  Press harder to increase the speed of movement to the chosen preset value of 20 or 40 degree/second. Release the button to stop the movement.

3-1-1-2 Movement to memorized positions

Memorized positions

Automatic rotation can be used for movement to one of three memorized positions as shown in the table below.

For automatic rotation to a memorized position (“last-used” or default)			
Memorized position name	**Use button reference**	**Last-used position (overrides Default position)**	**Default position (applied at each power-up + each time a new exam is started)**
CC	2	N/A	0°
+Oblique	1	Set when an exposure is made at an angle between +5° and +80°.	Operator choice, between +30° and +80°
-Oblique	3	Set when an exposure is made at an angle between -5° and -80°.	Operator choice, between -30° and -80°.

When a new position is memorized, the same numeric value is set for positive and negative movement. For example, if an exposure is made which sets the last-used +Oblique angle to +50°, the last-used -Oblique angle is set to -50°. The new position is only memorized for the current exam. On power-up and each time a new exam is started, the oblique position is set to the DEFAULT value.

How to reach a memorized position

- To rotate the Arm to one of these positions, press the button shown for more than one second and then release it.
- An automatic rotation movement started by pressing one of these buttons can be stopped at any time by pressing any of the buttons located on the Arm or one of the footswitches on the floor, or by touching the compression paddle.

How to choose a Default position value

- The two factory settings for the Default values are ± 45°.
- To change these values, use the X-ray Console set-up menus; see section *3 Configuring the X-ray Console set-up menus on page 84*.

3-1-2 Arm elevation control buttons (reference 5 in the illustration)

- Use one of these buttons to move the Arm up or down. Press the top or bottom of the button lightly to move the Arm up or down at low speed. Press harder to increase the speed of movement. Release the button to stop the movement.

Note:

If the Arm touches an obstacle during downward movement, the movement is stopped.

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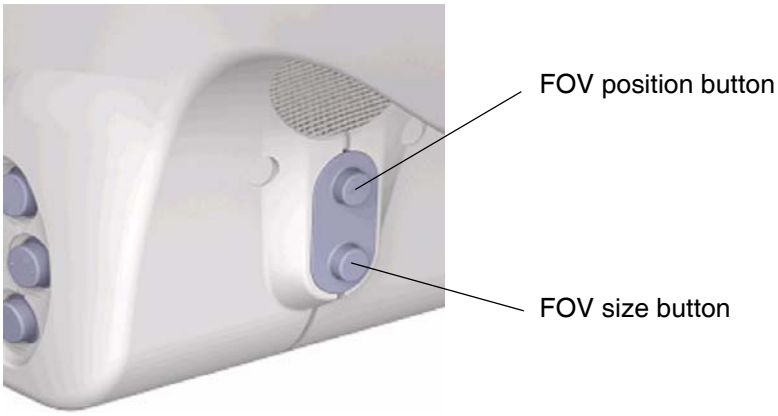
3-2 Collimator light and FOV control buttons

The field of view (FOV) is the area that is irradiated by X-rays during an exposure. Prior to exposure, its size (e.g. 9 x 9, 13 x18, 24 x 31, etc.) and position (left, right, centered) are set by pressing the Collimator light and FOV control buttons as described below.

X-ray tube head rear view



3-2-1 Turning on the Collimator light

When the Collimator light is off, turn it on by pressing either the FOV size button or the FOV position button. The light turns off automatically after approximately 45 seconds.

3-2-2 Setting FOV size

Press the FOV size button to change the field of view (FOV) to the next available size.

For information on display of FOV size on the Gantry readout and in screen and film annotations, see *1 Setting FOV size on page 119*.

3-2-3 Setting FOV position

Press the FOV position button (this button has raised dots to help you recognize it without looking at it) to move the collimated FOV to the next available position: left, center, or right. For more information, see *2 Setting FOV position on page 120*.

3-3 Face protection shield

Face protection shield is mounted on the front of the X-ray tube and tube housing assembly by sliding it into the interface plate rails. It can be easily installed and removed.

CAUTION

The Face protection shield must be removed when using a Magnification stand. The face protection shield must always be mounted on the front rails. The rear rails are intended for mounting the 2D Cross-hair device.
Make sure that the face protection shield is securely installed. Push it toward the rear of the tube head until you hear a click and feel a mechanical stop.

3-4 2D Cross-hair device

CAUTION

The 2D Cross-hair device must never be inserted in place of the face protection shield. It must be inserted below the X-ray tube head covers, from the REAR of the interface plate. Use of this accessory is described in Chapter 25 *2D Localization examination*.

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4 Compression carriage and Paddle holder assembly

Compression Carriage and Paddle holder assembly
Manual compression adjustment knobs
Paddle unlocking button
See *4-1-5 Removing a paddle on page 42*
Paddles
See *4-1 Interchangeable compression paddles on page 40*
Arm movement control buttons
See *3-1 Arm movement control buttons on page 37*

- **Compression Carriage and Paddle holder assembly**
  Interchangeable compression paddles are fitted to this assembly as required. The assembly can be moved up and down on the Arm to apply the desired amount of compression to the patient's breast. Compression may be controlled by using manual adjustment knobs (see below) or by using footswitches placed on the floor to control motorized movement of the carriage. See section *7 Footswitches on page 48*.
- **Manual compression and decompression adjustment knobs**
  The knobs located on each side of the paddle holder allow manual adjustment of the compression. Turn the top of the knob towards the patient to increase compression, away from the patient to decrease compression.

4-1 Interchangeable compression paddles

4-1-1 List of compression paddles

- A list of available compression paddles and their characteristics is given in Chapter 6 *Accessories*.

4-1-2 Recommendations

CAUTION

Only Senographe Essential recommended paddles and accessories should be used with this equipment. Failure to heed this warning may cause unexpected results and possible data loss.

! Notice:

Paddles must be handled carefully. Foreign matter, such as dust, dirt, or small objects, can enter their mechanisms and cause damage to the paddles. Physical shock and vibration can also damage paddles. Therefore, when paddles are not in use, they must be stored in an accessories cart where they are protected from dust, dirt, small foreign objects, physical shock and vibration.

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! Notice:

To avoid any risk of premature failure, it is recommended that the 2D large localization paddle and all spot paddles (sliding square, sliding round, and 2D spot localization) be used with a maximum compression force of 20 daN.

4-1-3 Installing a paddle

! Notice:

To prevent damage to the paddle and paddle holder, before installing a compression paddle:

- Make sure that Arm elevation is at a comfortable height,
- Make sure that the paddle interface plate is correctly aligned with the paddle holder rails.

- To install a paddle on the paddle holder, slide it onto the paddle holder rails. It will automatically lock when the position for clinical use is reached (central position for a non-sliding paddle, or one of the three positions for a sliding paddle - see section *4-1-4 Modifying the position of a sliding paddle with pre-defined positions on page 42*). The paddle is locked to the paddle holder and cannot be moved from this position unless the Operator activates the paddle unlocking button. See section *4-1-5 Removing a paddle on page 42*.

! Notice:

Before any use of a compression paddle, make sure that the paddle is correctly locked. Check that the paddle locking button on the compression carriage is in the locked position, and check by hand that the paddle cannot be moved. For sliding paddles, take care not to activate the sliding release button while making this check.

The type of paddle inserted in the paddle holder is recognized by the system and displayed on the Gantry readout. Only paddles designed and validated for use with the Senographe Essential system must be used; the characteristics of these paddles are known by the system and are taken into account, together with the known characteristics of breast tissue, when calculating parameters such as compression force and breast thickness.

Note:

When a paddle is used to apply compression to a rigid phantom (e.g., plexiglass), the thickness indicated on the Gantry readout is not correct because of the different characteristics of the material as compared to breast tissue.

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4-1-4 Modifying the position of a sliding paddle with pre-defined positions

Sliding paddles can be off-centered to the left or to the right of the Detector center in order to compress all the needed tissue in angulated views.

A sliding paddle has the following three defined positions:

- Centered
- Off-centered to the left (by 3.85 cm)
- Off-centered to the right (by 3.85 cm)

Sliding paddles are locked on the Paddle holder in the same way as non-sliding paddles, so the Operator can easily distinguish the following actions:

- Sliding action using one of the paddle sliding release buttons (available only on sliding paddles): See next paragraph.
- Unlocking action using the paddle unlocking button (available for all paddles): See section *4-1-5 Removing a paddle on page 42*.

• To allow the paddle to slide along the paddle holder, press one of the two paddle release buttons (the two buttons function identically, use the one that is easier to access). Release the button as soon as the paddle has slid from its initial position. When a pre-defined position is reached, the sliding paddle automatically locks itself into the new position.

  Compression and exposure are disabled if the sliding paddle is not in one of the three defined positions.

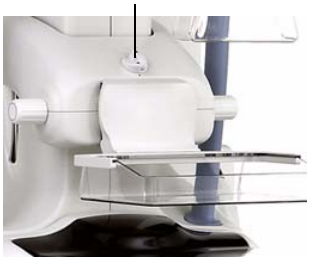
Paddle release buttons

4-1-5 Removing a paddle

A paddle can be unlocked and removed regardless of its position on the paddle holder. If the paddle is removed from one of the defined positions (e.g. off-centered to the left), at the next insertion it will be positioned in the same position (e.g. off-centered to the left).

• To remove a paddle from the paddle holder:
  - Turn clockwise the paddle unlocking button located on the paddle holder cover until it points to the unlocked padlock symbol on the paddle holder.
  - Release the button and slide the paddle away. The button then returns to its initial position.
  - In case of sliding paddle, the activation of sliding release button is not needed to remove the paddle.

Paddle unlocking button



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5 Image Receptor

The Image Receptor includes the Digital Detector and Breast Supports.

Breast supports include:

- Bucky,
- Magnification stand,
- Stereotactic Positioner.

5-1 Digital Detector

! Notice:

The digital detector is a very fragile and highly sensitive piece of equipment. The Bucky and the Mag Stand serve as a protective cover of the digital receptor. Take care never to leave the detector without the Bucky or the Mag Stand installed.

To avoid damage to the digital detector:

- Do not place small objects (needles, pens, etc.) on its surface.
- Take special care not to drop anything on the detector. Dropping an object onto the detector may damage it and can lead to expensive repair work or replacement of the digital detector.

Damage caused by these sorts of accidents are not covered by the GE Healthcare warranty.

5-2 Bucky for contact views

Bucky - Top view

Bucky - Bottom view

! Notice:

The surface of the Bucky is fragile. Scratching the surface of the Bucky may provoke artifacts in captured images. When handling the Bucky, take special care to protect the surface from shocks and objects that may induce a scratch.

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5-3 Magnification stand for magnification views

Magnification stand - Top view

Magnification stand - Bottom view

! Notice:

The surface of the magnification stand is fragile. Scratching the surface of the Magnification Stand may provoke artifacts in captured images. When handling the Magnification Stand, take special care to protect the surface from shocks and objects that may induce a scratch.

5-4 Stereotactic Positioner

Please refer to:

- Senographe Essential Stereotaxy Operator Manual.

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5-5 Installing the breast support (Bucky or Magnification stand)

Note:

Installation of the breast support is easiest when Arm angle is at 0° and with the Operator directly facing the Image Detector. If necessary, adjust Arm elevation to improve comfort and ease of breast support installation.

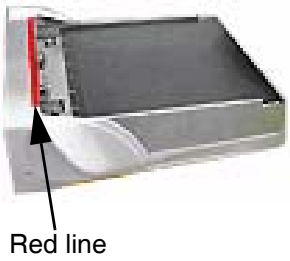
- Carefully align the breast support (Bucky or Magnification stand) with the rails and slide the breast support onto the rails.

Note:

Carefully align the breast support cover to be parallel to the detector. Inserting it at an angle may scratch the carbon top side of the detector and/or damage the breast support's electrical connectors.

- Press on the front side of the breast support until motor noise is heard, indicating the start of the locking phase. Motor noise is heard during the entire locking phase.

Red line at the rear of the Detector - if the red line is visible, this means that the breast support is not inserted correctly. It must be inserted correctly (red line not visible) before an exam can be performed.



- Once locking begins, the Operator can release pressure on the front side: locking takes place automatically.

WARNING

Before locking the breast support into place, check that there is no small object that could become wedged between the breast support and the white image receptor cover. This could degrade image quality.

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CAUTION

To avoid any risk of pinching fingers during installation of a breast support (Bucky or Magnification stand), slide the breast support onto the rails and push it rearward by pressing on its front side until the locking motor starts. During the automatic locking phase, keep hands away from the moving part (breast support) and white covers of the Image Detector.

In an emergency to stop the automatic locking or unlocking of the breast support, just press briefly on either of the breast support unlocking buttons. The breast support can at this point be unlocked by the usual procedure (simultaneously press both breast support unlocking buttons, see section *5-6 Removing the breast support on page 47*).

- For magnification views, remove the Bucky and install a Magnification stand. The Magnification stand is installed in the same way as the Bucky. Insert it until it reaches a position where motorized locking occurs. The Magnification stand is then automatically locked.

  Magnification factors are defined in the middle of a 4 cm thick breast, i.e., 2 cm above the Magnification stand. Two Magnification stands are available: one for a magnification factor of 1.5 and one for 1.8.
- The Image Detector is placed as required for correct patient positioning by moving the Arm. The height of the Bucky breast support surface from the floor is adjustable between about 650 mm (26 inches) and 1500 mm (59.1 inches) with the Arm in the 0° position.

Note:

Surfaces which contact the breast (e.g., the Bucky, Magnification stand, and compression paddles) must always be kept clean; see Chapter 28 *Planned Maintenance*.

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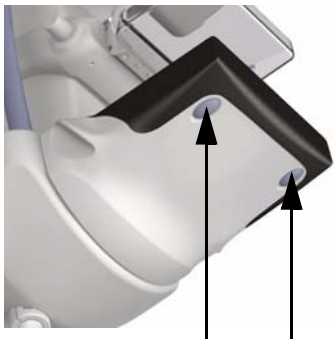
5-6 Removing the breast support

- Simultaneously press on both breast support unlocking buttons located under the white covers of the Image Detector. It is only necessary to press the two buttons briefly in order to start the unlocking phase of the breast support. Motor noise is heard during the entire unlocking phase. Do not pull on the breast support: unlocking takes place automatically. When the motorized unlocking movement stops (after about three seconds), manually remove the breast support by sliding it along the rails.



Breast support unlocking buttons

CAUTION

The side of the breast support that is the last to slide free of the rails is heavier than the other side. Be sure to be prepared for this extra weight by grasping the breast support at a sufficient distance from the front edge before removing the breast support.
The Operator must use both hands during the entire breast support removal procedure.
The careful attention of the Operator during the entire breast support removal procedure is necessary.

! Notice:

Do not remove the breast support by force.

! Notice:

Breast supports (Buckies and Magnification stands) must be handled carefully. Foreign matter, such as dust, dirt, or small objects, can enter their mechanisms and result in damage to the breast supports. Physical shock and vibration can also damage breast supports. Therefore, when breast supports are not in use, they must be stored in an accessories cart where they are protected from dust, dirt, small foreign objects, physical shock and vibration.

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6 Gantry readout

- The Gantry readout display normally shows the following information (left to right):
  - Compressed breast thickness in mm.
  - Angle of rotation.
  - Compression force in daN.
  - Magnification factor that appears for a few seconds in a specific Operator message at the moment when the Magnification stand is installed.
- It may also be used for warning messages and (for stereotaxy applications) angulation information.

7 Footswitches

- The footswitches are used to apply/release compression and increase/decrease the Arm height. There are two sets of footswitches placed on the floor at the base of the Gantry, one on the left and one on the right.

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Chapter 6 Accessories

Accessories are classified into six categories. See the corresponding sections:

- Section *1 Compression paddles on page 49*
- Section *2 Breast supports on page 52*
- Section *3 2D Localization accessories on page 53*
- Section *4 Patient positioning accessories on page 53*
- Section *5 Patient identification accessories on page 54*
- Section *6 Image quality control accessories on page 54*

The following accessories are **optional** or **basic** depending on country. Please contact your GEHC Sales Representative.

1 Compression paddles

1-1 Paddles characteristics

A large variety of paddles may be used with Senographe Essential.

- They may be parallel or flexible,
- They may be sliding with pre-defined positions, sliding without pre-defined positions, or non-sliding at all,
- Their shape may be rectangular, round or square,
- They may be used for compression or localization,
- They may be used in contact view or magnification view.

1-2 Flexible paddles specifications

The flexible compression paddles are designed to provide uniform compression from chest wall to nipple, and from medial to lateral (or superior to inferior, depending on arm rotation angle), by tilting with respect to the Bucky as compression is applied. They are self-adjusting, and can be used in place of parallel paddles. The flexible paddles are not intended to remain flat and parallel to the breast support surface when compression is applied. They do, however, comply with MQSA Quality Mammography Standard 21 CFR 900.12(b)(8)(ii)(C) regarding equipment intended by the manufacturer's design to not be flat and parallel to the breast support surface.

To ensure continued performance of a flexible compression paddle according to its specifications, the tests described in section *4-2 Test for flexible paddle deflection in compression on page 273* in Chapter 28 *Planned Maintenance*, should be performed at least once every year or when a loss in performance is suspected.

The test results must meet the following action limits:

Minimum deflection 12 mm; Maximum deflection 14 mm.

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1-3 Compression paddle list

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
24 x 31 paddle Parallel non-sliding		Contact view	Contact GEHC Sales Representative	See section *4-1 Interchangeable compression paddles on page 40* in Chapter 5 *Gantry*.
Flexible 24 x 31 paddle Flexible non-sliding		Contact view	Contact GEHC Sales Representative	
Axillary Paddle Parallel sliding without predefined positions		Contact view	Contact GEHC Sales Representative	
Sliding 19 x 23 paddle Parallel sliding with predefined positions		Contact view	Contact GEHC Sales Representative	
Flexible sliding 19 x 23 paddle Flexible sliding with predefined positions		Contact view	Contact GEHC Sales Representative	

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Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
Sliding square spot paddle Parallel sliding with predefined positions		Contact view	Contact GEHC Sales Representative	See section *4-1 Interchangeable compression paddles on page 40* in Chapter 5 *Gantry*.
Sliding round spot paddle Parallel sliding with predefined positions		Contact view	Contact GEHC Sales Representative	
Round spot magnification paddle		Magnification view	Contact GEHC Sales Representative	
Square Spot Magnification Paddle		Magnification view	Contact GEHC Sales Representative	
19 x 23 magnification paddle		Magnification view	Contact GEHC Sales Representative	

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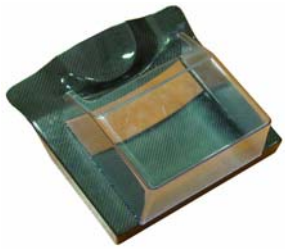
2 Breast supports

2-1 Types

Breast supports include:

- Bucky,
- Magnification Stand.

2-2 Breast support list

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
Bucky with markings		Contact view	Contact GEHC Sales Representative	See section *5-5 Installing the breast support (Bucky or Magnification stand) on page 45* in Chapter 5 *Gantry*.
1.5 Magnification stand		Magnification view	Contact GEHC Sales Representative	
1.8 Magnification stand		Magnification view	Contact GEHC Sales Representative	

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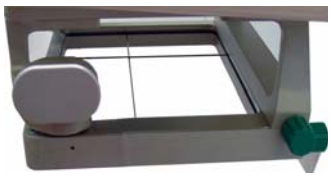
3 2D Localization accessories

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
2D Cross-hair device		Localization for biopsy	Optional	See section *1 Face shield and 2D Cross-hair device on page 213*
2D Large localization paddle		Localization for biopsy	Optional	See section *4-1 Interchangeable compression paddles on page 40* in Chapter 5 *Gantry*.
2D Spot localization paddle		Localization for biopsy	Optional	

4 Patient positioning accessories

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
Hydraulic chair	Not shown	Patient positioning	Optional	
Face protection shield		Patient positioning Contact view only	Basic	See section *1 Face shield and 2D Cross-hair device on page 213*

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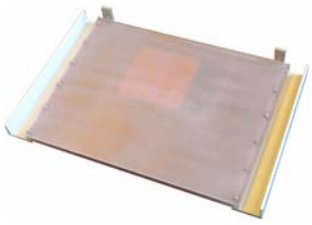
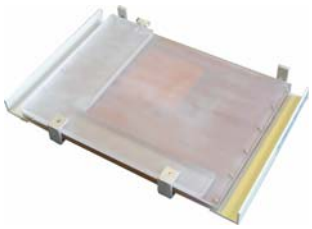
5 Patient identification accessories

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
Bar code scanner for AWS		Patient identification	Optional	See section *3 Bar code scanner option on page 157* in Chapter 19 *Worklist*

6 Image quality control accessories

Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
ACR Mammo phantom		Quality Control Test	Optional	Senographe Essential *Acquisi*tion QC Manual
IQST phantom		Quality Control Test	Basic	
IQST phantom magnification adaptor		Quality Control Test	Basic	
Acrylic plates		Quality Control Test	Contact GEHC Sales Representative	

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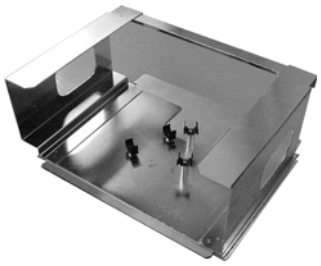
Name Characteristics	Illustration	Context	Basic or Optional	Physical/ Functional description
Calibration plates		Quality Control Test	Basic	Senographe Essential *Acquisi*tion QC Manual
Dosimeter support		Quality Control Test	Basic	

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Chapter 7 Control Station

1 Overview

1-1 Control Station functions

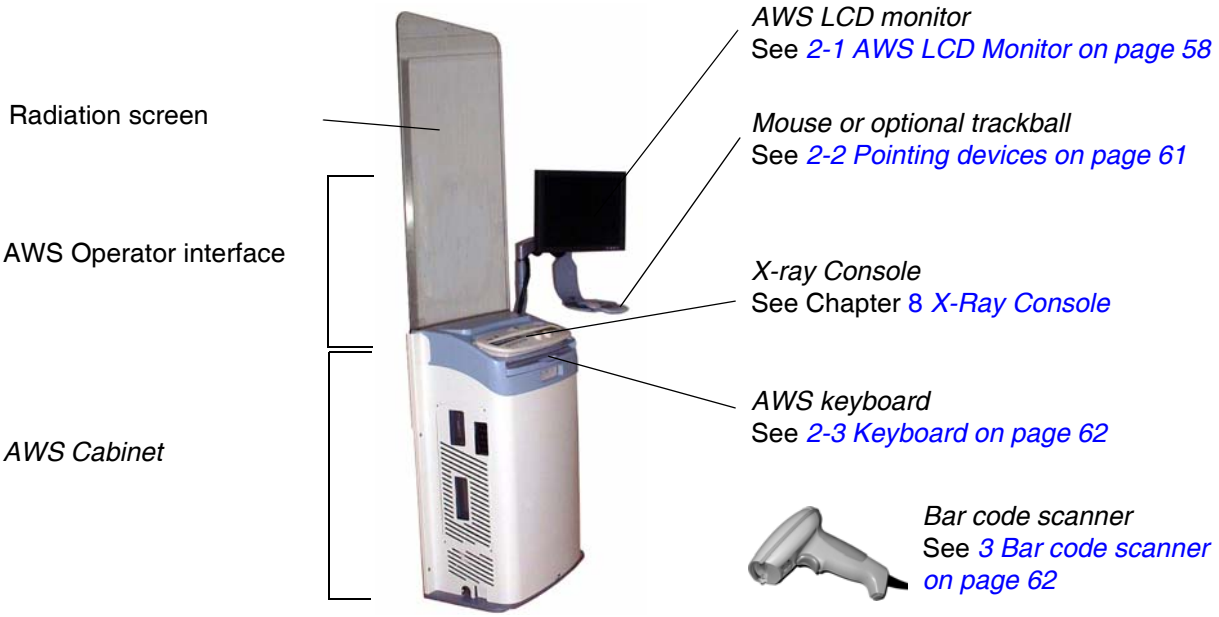
The Control Station provides the following functions:

- Image acquisition from the Digital Detector
- Image display and manipulation
- Management of patient information and Examination database
- Image transfer to other Workstations using the DICOM standard
- Filming of images (on optional printer)
- Archiving images (on optional mass archiving system)
- Saving of images on recordable CD-ROMs

Senographe Essential applications are based upon a graphical, multi-window, mouse- or trackball-driven interface.

Images, lists, menus, and control panels are displayed within graphical windows on the AWS LCD monitor. Selections are made using on-screen buttons, menus and control panels, etc., by pointing and clicking with the mouse or optional trackball. See sections *2-1-2 Windows on page 58* and *2-1-3 On-screen tools on page 59*).

1-2 Control Station hardware


Radiation screen
AWS Operator interface
AWS Cabinet
AWS LCD monitor
See 2-1 AWS LCD Monitor on page 58
Mouse or optional trackball
See 2-2 Pointing devices on page 61
X-ray Console
See Chapter 8 X-Ray Console
AWS keyboard
See 2-3 Keyboard on page 62
Bar code scanner
See 3 Bar code scanner on page 62

The Senographe Essential Control Station comprises:

- A radiation screen mounted on the AWS Cabinet. The X-ray Console may be mounted on top of the cabinet.
- A Operator interface, called AWS, which includes a Liquid Crystal Display (LCD) monitor, alphanumeric keyboard, and pointing device (mouse or optional trackball) for Operator interaction with the Control Station's ADS computer.

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- A computer unit (with internal hard disks for system software and image storage), housed inside the AWS Cabinet.

2 AWS Operator interface

2-1 AWS LCD Monitor

2-1-1 Recommendations

WARNING

THE AWS LCD MONITOR MUST *NOT* BE USED FOR FINAL INTERPRETATION OF EXAMINATIONS.

Note:

The AWS LCD monitor must be used in a suitably dark environment when reviewing a digital image. The maximum recommended ambient light level is 50 lux.

CAUTION

To reposition the monitor (to move it forward, backwards or rotate around the lead glass shield) only use the handle to avoid being pinched.

2-1-2 Windows

There are several types of windows that will be encountered as you use the Senographe Essential AWS.

The most important ones are:

- The *Browser*. This is the main window used to manage the database, start the Review application, etc. See Chapter 18 *Browser*.
- The *Worklist* is used to display a list of scheduled operations. From this window you can start image acquisition and review operations. See Chapter 19 *Worklist*.
- The *Viewer* is used by the acquisition and review applications to display and process the images. See Chapter 21 *Viewer*

These main windows give access to other windows, such as the *Medical Procedure Card* window, the Annotations window in the Viewer, various Operator selection windows, etc.

Also, small message windows concerning procedures in progress appear on the AWS LCD monitor as you perform various functions. Some of these disappear on their own, others remain on the screen and the application remains blocked until the message is acknowledged by clicking on *OK* or *Cancel*.

Note:

If the system does not respond because two or more windows are open one on top of another, it is possible to recover by pressing the *Front* key on the keyboard (several times if needed) to access hidden windows.

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2-1-3 On-screen tools

2-1-3-1 Cursor

The cursor is the on-screen symbol, usually an arrow, which you maneuver across the screen using the trackball or mouse, to point to menus, lists, images, and windows.

The cursor changes shape or orientation to indicate a change in function. Some examples:

- When you point to a menu item and click with the left mouse button to open a pull-down menu, the cursor changes to an arrow pointing to the right, to indicate you can now make a selection in the pull-down menu.
- The cursor changes into a watchface if a function that you have selected takes more than a moment to implement; no further function selection is available until the procedure is completed.
  Once the procedure is finished, the cursor returns to an arrow shape, indicating that the Workstation (AWS) is ready to accept further input.

2-1-3-2 On-screen buttons

Most windows contain on-screen buttons (areas in the form of buttons, containing explanatory graphics or text labels) to activate specific functions. These functions are described in detail elsewhere in this manual. Such buttons are sometimes referred to as *icons*.

To select (or activate) a button, click it.

When a button's label is shaded grey rather than white, it means that the button's function is currently not available.

2-1-3-3 Menus

Certain buttons activate specific functions directly. Others activate drop-down menus that allow you a choice of functions.

To select (or activate) a function in a menu, move the cursor onto the menu item and click. The Workstation (AWS) carries out your command, and the menu disappears.

When a menu item is shaded grey rather than white, it means that the function is currently not available.

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2-1-3-4 Scroll Bar

A scroll bar is an on-screen tool that you use to page through data that cannot be fully displayed at once on the screen or in a particular window, such as lists of patients or exams in the Browser.

- To move through the data controlled by the scroll bar (images, items in a Browser list, etc.), you can place the cursor on the vertical rectangular bar within the scroll bar.
  Then, press and hold the left mouse button, and drag the cursor up or down to move backward or forward through the list. The vertical bar within the scroll bar shows you where you are within the list as compared to the list as a whole.
  Release the mouse button when the desired data are displayed.

- If you wish to move through the data one item at a time, place the cursor on either the upper or lower arrow and click the left mouse button. Each click moves you up or down by one item of the data.

- If you wish to move through the data one page at a time, place the cursor either above or below the vertical bar and click the left mouse button. Each click now moves you up or down by one page of data.

A scroll bar becomes active only if the display capacity of the list is exceeded. Otherwise, the vertical bar fills the full height of the scroll bar, and clicking on the vertical bar or the arrows has no effect.

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2-2 Pointing devices

2-2-1 Introduction

The Senographe Essential is supplied with a mouse or trackball pointing device, which allows you to select and interact with items displayed on the AWS LCD monitor.

A mouse is supplied as standard, but a trackball is available as an option. Both are hand-operated devices which move the cursor (an on-screen arrow or other symbol; see section *2-1-3-1 Cursor on page 59*) across the AWS LCD monitor screen. For instance, moving the mouse to the right, or rolling the trackball to the right, causes the cursor to move to the right, and so on. Both devices include buttons for selection and interaction with on-screen objects.

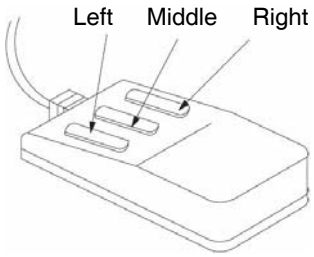
2-2-2 Mouse and trackball buttons

Throughout this manual instructions for use of buttons on the pointing device refer to them as if they were mouse buttons, named left button, middle button, and right button. This is done because most users are familiar with the use of a mouse, and because trackballs can be configured in different ways.

The illustrations and table below show the correspondence between mouse buttons and trackball buttons as configured for the Senographe Essential:

Mouse button	Equivalent trackball buttons	
Left button	button 3	button 4
Right button	button 1	button 6
Middle button	button 2	button 5

Mouse buttons



Trackball buttons

2-2-3 Using the pointing device

With the cursor positioned on the appropriate object on screen, the left button is used to *select* a window, an on-screen button, or an item in a menu list.

The middle and right buttons are used for specific operations, described in the appropriate sections of this manual.

- “Click” means to press and release a button without moving the cursor.
- “Double-click” means to click a button twice in rapid succession.
- “Press and drag” means to move an item across the screen. With the cursor on the item, press and hold the appropriate button while moving the mouse or rolling the trackball, “dragging” the selected item.
- “Drag and drop” means to drag an item and “drop” it in a new location. Drag the item as described above (“press and drag”), then drop it in the required position by releasing the button. Specific “drag and drop” operations are described in more detail in the appropriate sections of this manual.
- *Important:* "Clicking the mouse button", “pressing a button”, “selecting a menu item”, etc. in this manual always refer to using the left mouse button, unless the middle or right mouse button is specifically mentioned.

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2-3 Keyboard

Depending on the keyboard delivered with your system, the Caps Lock and Control keys may be inversed.

The keyboard is used for entering text at on-screen prompts and alphanumeric data in data entry fields.

Use the *Delete* or *Back Space* key to erase entered text or data.

The use of the *Shift* and *Control* keys is described in the appropriate sections of this manual.

3 Bar code scanner

A bar code scanner can be supplied as an option to allow rapid and accurate entry of patient data in hospitals. See section *3 Bar code scanner option on page 157* in Chapter 19 *Worklist* for more information.

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Chapter 8 X-Ray Console

1 overview

- The console is normally mounted on the AWS Cabinet, behind the radiation screen.
- The X-ray Console:
  - Controls power On/Off facilities. It is used to power up the complete system, and to power down the Gantry and Generator.
  - Provides control buttons and status indicators which enable the Operator to prepare, execute, and monitor X-ray exposures.
  - Provides LCD panels that display operating parameters and messages from the system.

Labels
See *2 Labels on page 63*

Plugs for connection of remote handswitch and cable to generator.

Buttons, switches and displays.
See *3 Buttons, switches and displays on page 64*

Optional remote handswitch (usually mounted on the side of the AWS Cabinet).

2 Labels

The symbol ⚠ on the X-ray Console indicates that you must have read and understood the Operator Manual before taking any action.

The symbol ☢ on the X-ray Console indicates that this is X-ray equipment. It is dangerous to both patient and Operator unless measures of protection are strictly observed.

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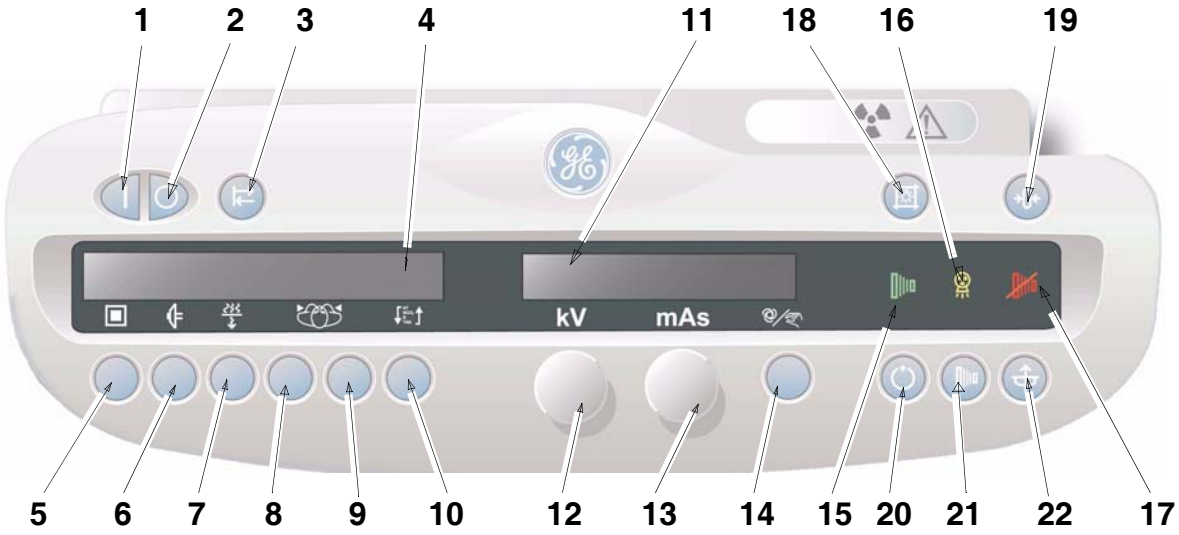
3 Buttons, switches and displays

The illustration and table below identify the various console buttons, switches and displays. Information on each numbered item is given in the following pages.



3-1 Buttons, Switches and Displays summary

1	Gantry/Generator power on switch I	12	kV selection knob
2	Gantry/Generator power off switch O	13	mAs selection knob
3	Set-up button	14	AOP and manual mode selection button
4	Readout display	15	Exposure enable lamp
5	Focal Spot selection button	16	Exposure indicator lamp
6	Focal track selection button	17	Exposure disable lamp
7	Filter selection button	18	Centering light ON button
8	Breast laterality - Left button	19	Exposure interrupt button (with indicator lamp)
9	Breast laterality - Right button	20	Prep button with indicator lamp
10	Special views selection button	21	Exposure button
11	kV and mAs readout display	22	Compression release button

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3-2 Buttons, Switches and Displays detailed description

1. **Gantry/Generator power on switch I**
   - Press this button to power on the Gantry and Generator and other system components; the indicator lamp lights and the system startup procedure begins. The X-ray Console displays the last configuration used.
2. **Gantry/Generator power off switch O**

   Press this button to power off the Gantry and Generator; the indicator lamp lights.

   Note:

   For more information on startup and shutdown procedures, see Chapter *12 Startup and shutdown*.
3. **Set-up** button
   - Press this button to access X-ray Console set-up functions; language selection, MEDICAL menu, and view selection for recumbent patients. See section *4 X-ray Console set-up menus on page 68* for more information.
4. **Readout display**

   The readout displays two lines of up to 40 characters.
   - The upper line displays information, safety, and error messages.
   - The lower line displays selected parameters: focal spot, focal track, filter, breast Laterality, View names, presence of magnification view, and FOV size.
5. **Focal Spot selection** button
   - Small and large focal spots (0.1 or 0.3 respectively) are selected automatically according to the presence or the absence of a magnification stand. Do not try to override this selection as the exposure will be forbidden. The readout indicates the size of the selected focal spot.

	Focal Spot automatic selection
Magnification Stand not installed	0.3
Magnification Stand installed	0.1

6. **Focal track selection** button
   - Press this button to switch between the two anode tracks; molybdenum (Mo) and rhodium (Rh).
     - In manual mode, press the button to select the anode track.
       The readout indicates the track selected. See section *3 Manual mode on page 126*.
     - In AOP (Automatic Optimization of Parameters) mode, selection is automatic, and pressing the button has no effect.
7. **Filter selection** button
   - Press this button to switch between the two filters, molybdenum (Mo) and rhodium (Rh).
     - In **manual** mode, press the button to select the filter.
       The readout indicates the filter selected. See section *2 AOP-Modus on page 131*.
       Certain filter/anode track pairs are inhibited, according to the selected kV value. The system automatically selects an authorized filter and displays the selection. For suggested filter/anode track pairs, see table *1 Empfohlene manuelle Techniken für Routineuntersuchungen (d. h. nicht für Stereotaxie-Untersuchungen): on page 133*.
     - In **AOP** mode, filter selection is automatic, and pressing this button has no effect.

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8. **Breast** Laterality **- Left button**
   - When acquiring an image, press this button to indicate that a LEFT breast is being imaged.
9. **Breast** Laterality **- Right button**
   - When acquiring an image, press this button to indicate that a RIGHT breast is being imaged.

Note:
Selection of breast Laterality (left or right breast) is mandatory. If Laterality is not selected by the Operator, the exposure command is disabled.

10. **Special views selection** button

    View names are normally determined automatically; the View names used are based on the American College of Radiology (ACR) View name convention; see section *1 Introduction on page 113* for more information. This button is used to modify the View name if a special view is used.
    - Automatic view selection:

      After the Operator selects breast Laterality, the system determines and displays the correct View name according to the Gantry Arm angle. View names selected automatically are:
      RCC, LCC, RMLO, LMLO, LSIO, RSIO, LML, RML, LLM, RLM, LLMO, RLMO, LFB, RFB.

      If magnification is in use, the letter M is automatically added to the View name after the Laterality letter (e.g., LMCC for a magnification view on the left breast in the CC position).

      See section *4 Core View name - selected automatically on page 115*.
    - Special view selection:

      When a special view is used which does not correspond to the automatic view selection, press the ***Special Views*** *selection* button as often as required until the desired View name appears. See section *5 Core View name modified manually (standing or sitting patients) on page 116*.
    - Recumbent patients:

      The automatic and special view selection procedure applies only to standing or sitting patients. View names for recumbent patients (patients unable to stand or sit for the mammogram) are selected using the *Recumbent patients* menu as described in section *6 Core View names for recumbent patients on page 116*.
11. **kV and mAs readout display**

    During routine exams (i.e. Non-Stereotaxy exams):
    - **In manual mode** the readout displays the kV and mAs values selected by the Operator.
    - **When an AOP mode is selected**, the kV readout displays the code of the selected mode: CNT (Contrast), STD (Standard), or DOSE. The mAs readout displays AUTO.
    - **At end of exposure**, the kV readout displays two types of information:
      - the first letter (**C, S or D**) of the code of the selected mode (CNT, STD, or DOSE),
      - the kV value selected and used during the exposure, and followed by the letter **A** (i.e. **AOP**);

      the mAs readout displays the mAs value used during the exposure.

    During Stereotaxy exams:
    - **In manual mode** the readout displays the kV and mAs values selected by the Operator.
    - **When AUTO mode (i.e. AOP mode for Stereotaxy exam) is selected**, the kV readout displays the code of the selected mode: AUTO (Automatic). The mAs readout displays AUTO.
    - **At end of exposure**, the kV readout displays two types of information:
      - the letter **X** corresponding to **AUTO mode**,
      - the kV value selected and used during the exposure, and followed by the letter **A** (i.e. **AOP**);

      the mAs readout displays the mAs value used during the exposure.

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12. **kV selection knob**
    - In **manual** mode, turn the kV selection knob to select the required kV value; the displayed value changes as the knob is turned. Available values are 22 kV through 49 kV in steps of 1 kV. There is no mechanical stop; you can continue to turn the KV selection knob past the minimum or maximum value (22 kV or 49 kV), but the displayed value no longer changes. See section *3 Manual mode on page 126*.
    - In **AOP** mode, turning the KV selection knob has no effect.
13. **mAs selection knob**
    - In **manual** mode, turn the mAs selection knob to select the required mAs value; the displayed value changes as the knob is turned. Available values are 4 mAs through 500 mAs, but some parameter selections may change these limits (e.g. the X-ray Console can display as high as 600 mAs whereas the exposure is automatically limited to 500 mAs). There is no mechanical stop; you can continue to turn the mAs selection knob past the minimum or maximum value, but the displayed value no longer changes. See section *3 Manual mode on page 126*.
    - In **AOP** mode, turning the mAs selection knob has no effect.
14. **AOP and manual mode selection** button

    During routine exams (i.e. Non-Stereotaxy exams):

    Press the mode selection button to step through the four possible image capture modes; three AOP modes and one manual mode.
    - Three **AOP** modes are available, according to the **priority** required**:**
      - **CNT (**Contrast)

        Priority is given to optimum subject contrast, while minimizing patient dose.
      - **STD** (Standard)

        Gives a compromise between good contrast and dose reduction.
      - **DOSE** (Dose)

        Priority is given to dose reduction, with acceptable image quality.
    - When AOP mode is selected, the selected priority code appears on the kV readout and AUTO is displayed on the mAs readout. When the exposure is complete, the initial letter of the code selected appears on the kV readout.
    - **Manual** mode is used to allow manual selection of kV and mAs values.

    During Stereotaxy exams:

    Press the mode selection button to step through the two possible image capture modes; one AOP mode (AUTO mode) and one manual mode.
    - **AUTO** mode is the AOP mode used by the system for Stereotaxy exams.
    - When AOP mode is selected, **AUTO** appears on the kV and mAs readout. When the exposure is complete, the letter **X** appears on the kV readout.
    - **Manual** mode is used to allow manual selection of kV and mAs values.
15. **Exposure enable lamp**
    - When this lamp is lit, exposure is enabled.
16. **Exposure indicator lamp**
    - This lamp is lit from the start to the end of an exposure.
    - A buzzer sounds at the end of exposure.

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17. **Exposure disable lamp**
    - When this lamp is lit, exposure is disabled. Follow the instructions displayed on the left hand section of the console readout.
18. **Centering light ON button**
    - Press this button to switch on the centering light for 45 seconds. The button lights.
      Note that the centering light does not function when an exposure is initialized.
19. **Exposure interrupt button** (with indicator lamp)
    - Press this button to terminate the current exposure if a problem occurs. The lamp is illuminated and a buzzer sounds.
      Press the button again to stop the buzzer and reset the system.
20. **Prep button** with indicator lamp
    - Press this button to prepare the exposure (anode rotation).
      When the Exposure Enable lamp lights, exposure can be triggered.

Note:
If the Prep button is released before the Exposure Enable lamp is lit, the preparation is cancelled; preparation stops one second after release.

21. **Exposure button**
    - Press and hold this button while the Exposure Enable lamp is lit to make an exposure. To stop the exposure immediately, release the Exposure button.
      A buzzer sounds at the end of exposure.

Note:
In AOP mode, and following preparation (anode rotation), exposure is made in two stages:

- An absorption measurement exposure (the "pre-exposure"), to allow selection of the optimum kV, focal track, and filter combination for the chosen priority. These parameters are then set automatically. Maximum pre-exposure time is 70 ms (large focal spot) or 130 ms (small focal spot).
- An exposure during which image acquisition is made.
- The Operator must maintain pressure on the Exposure button until the buzzer stops to obtain proper exposure.

22. **Compression release button**
    - Press this button to release compression. The compression paddle automatically moves up to the pre-programmed auto-decompression height.

Note:
If auto-decompression is selected in the MEDICAL menu, compression is released automatically at the end of the exposure.

4 X-ray Console set-up menus

See section *3 Configuring the X-ray Console set-up menus on page 84* of Chapter 11 *Initial training and set-up*.

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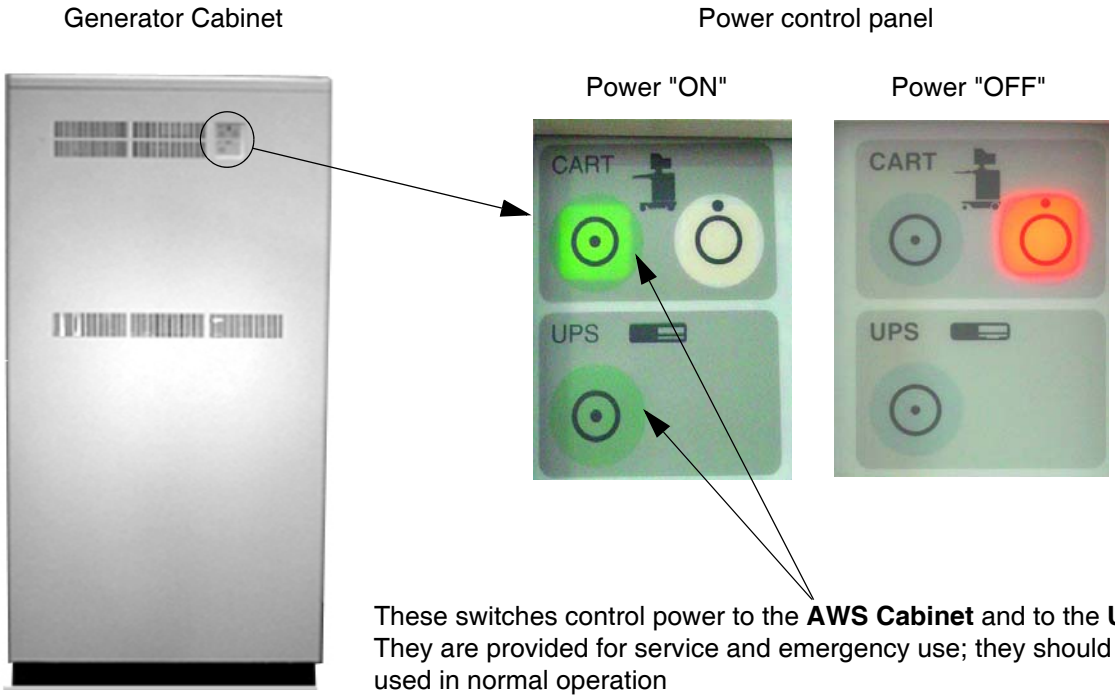
Chapter 9 Generator Cabinet

1 Presentation

The Generator Cabinet contains power switching equipment, the generator and system management electronics, and a chiller (connected to the Digital Detector for control of the detector environment).


Generator Cabinet
Power control panel
Power "ON"
Power "OFF"
CART
UPS
CART
UPS
These switches control power to the **AWS Cabinet** and to the **UPS**. They are provided for service and emergency use; they should not be used in normal operation

- The Generator Cabinet is mounted on wheels for ease of installation; it is not recommended that it be moved in normal operation.
- Do not obstruct the ventilation slots.
- The power control panel visible on the cabinet controls power to the Control Station and to the UPS. It is normally used only for service operations.

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Chapter 10 Examination steering guide

1 Prerequisites on page 72
2 Power up and startup the system on page 72
3 Receive the patient on page 72
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4-1 Patient exam selection on page 73
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6 Acquire other images on page 80
7 Working with images resulting from an examination on page 81
7-1 Quality Check (with or without RRA) on page 81
7-2 Preparation of images for CAD & review on page 81

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7-3 Transfer images on page 81
7-4 Print images on page 81
8 Store images on page 82
9 Power off system on page 82

This chapter explains the procedure for examinations using the Senographe Essential, from the preparatory tasks to be performed on the equipment (selection of exposure mode, configuration, etc.) through patient positioning, with notes on the exposure sequence and image processing.

1 Prerequisites

1-1 Training

See section *1 Training program on page 83*.

1-2 User (Operator) account

See section *2 User account on page 83*.

1-3 Configure the system

See section *3 Configuring the X-ray Console set-up menus on page 84*.

2 Power up and startup the system

See section *1 Startup procedure on page 87*.

3 Receive the patient

Women undergoing a mammography examination often feel apprehensive because of the examination and the ensuing diagnosis.

To reassure the patient, receive her in a warm room and provide a simple but precise explanation of the procedure. Pay particular attention to breast compression, which can cause discomfort, but is mandatory in order to produce a high quality exam and ensure reliable diagnosis.

It is best to examine the breast during the first half of the menstrual cycle (1st through 14th day). The breasts are less tender and less painful before ovulation.

Examination of the breast requires the patient to disrobe from the waist up. An appropriate cover should be provided during the waiting period.

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4 Prepare examination

4-1 Patient exam selection

4-1-1 Patient exam selection with Worklist

Exposures can only be made after patient/exam selection from the Worklist (see Chapter 19 *Worklist*).

4-1-2 Patient exam selection without Worklist

If the examination has not been scheduled and included in the Worklist, a new entry can be made, but image acquisition is not permitted until basic patient information has been recorded in the system.

4-2 Check the selection of Medical Application preferences

The options provided for *Medical Application preferences* are usually set to suit the majority of exposures made at your facility, but you may wish to change them for a particular patient or type of examination.

See section *8-3 Medical Application preferences on page 140* for more information.

4-3 Start examination

After selection of the patient for whom you want to start acquiring images, click the *Start Exam* button to continue with the image acquisition. The Viewer window (see Chapter 21 *Viewer*) opens.

Note:

If the following message appears in a dialog box:
"*Current processing is for QC purposes only. For Clinical application, click OK and enable Fine View in Medical Application preferences, Image Process. tab.*";
It means that *Fine View* is currently set to *Disable*, which is the configuration for Quality Check tests only.
Click *OK* and go to *Tools menu/Medical Application preferences* to set *Fine View* to *Enable*. See section *8-3-9 Image Process. on page 146*.

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5 Examination: acquire the 1st image

5-1 Preparing the equipment

5-1-1 Selecting magnification mode (contact view versus magnification view)

Configure the system for the required magnification mode (1x for contact view, 1.5x or 1.8x for magnification view).

5-1-2 Selecting the proper breast supports (Mag. stand and compression paddle)

The digital detector incorporates a removable grid (Bucky). For magnification views (1.5 x or 1.8 x) remove the Bucky and replace it by the appropriate Magnification stand. See section *5 Image Receptor on page 43* in Chapter 5 *Gantry*.

5-1-3 Mounting the breast supports

Always make sure that the magnification stand is correctly locked in place before starting an exam.

Install the appropriate compression paddle. To accommodate different breast sizes, there are different sized paddles available. Check that the type of paddle is correctly recognized by the system and displayed on the Gantry readout. Paddles not designed for use with the system may give incorrect results. See section *4 Compression carriage and Paddle holder assembly on page 40* in Chapter 5 *Gantry*.

The result of breast support mounting is that the following are automatically selected by the system:

- Magnification mode (contact view or magnification view),
- Focal spot size (large for contact view, small for magnification view).

5-1-4 Setting Arm rotation

Rotate the Arm to the appropriate angle for the desired view. See section *3 X-Ray tube head on page 37* in Chapter 5 *Gantry*.

5-1-5 Setting FOV size and FOV position

The initial FOV size and position depend on magnification mode (contact view or magnification view), Arm angle and paddle type inserted. This means that most of the time, the initial FOV size and position are convenient for the examination being prepared. For more information, or to change FOV size or position, see section *3-2 Collimator light and FOV control buttons on page 39* in Chapter 5 *Gantry* and Chapter 16 *Setting FOV size and position*.

5-2 Check the patient

See section *6-1 Check the patient on page 28* of Chapter 3 *Safety recommendations*.

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5-3 Positioning the patient

It is important to relax the patient. Any contraction of the pectoral muscles or muscles of the Arm can cause an error in positioning.

Elevate the breast and center it on the image receptor over all its surface:

1. Remove folds from the skin.
2. Bring out the nipple and position it in profile when possible. Do not sacrifice breast tissue for nipple profile.
3. Bring out the inframammary angle for applicable views.
4. Use the centering light to check the field size, and ensure there are no artifacts obscuring the breast (e.g. hair, earrings, etc.).

Note:

Using a sliding paddle facilitates the positioning of a small/medium-breasted patient, especially in angulated views.

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5-4 Use of markers

5-4-1 Digital markers: Laterality and View name

- Check the Laterality and Core View name selection. See Chapter 15 *View name selection* if necessary.

5-4-2 Manual markers

5-4-2-1 Use of markers in general

When the patient is positioned for a Cleavage view (CV), external markers must be used to assist in determining Laterality when viewing the image. Place a Right (R) or Left (L) marker in the lateral aspect of the breast of interest, or place markers on the lateral side of each breast. Markers must be placed outside of the 230 mm x 190 mm ROI (Region Of Interest) used by AOP for 24 x 31 image size, or the 160 mm x 140 mm ROI used by AOP for 19 x 23 image size.

5-4-2-2 Use of markers in AOP mode

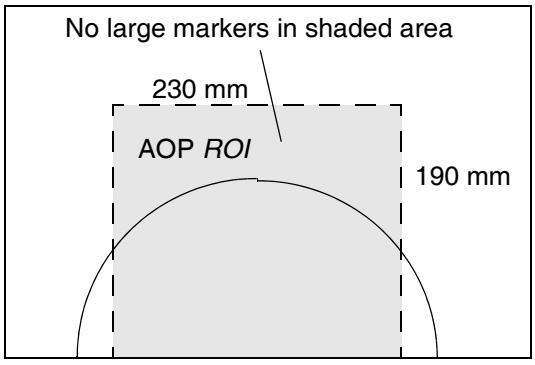
The algorithm used in AOP mode searches for the most dense part of the breast, and uses this as a reference in its calculations. It is therefore important to avoid the presence of dense objects in the area used by the algorithm.

When using AOP mode, do not place large markers such as View name markers in the area used by the AOP algorithm. They may be used anywhere outside this area. Small markers with an area no greater than 2 mm^2, such as BB markers up to 1.6 mm in diameter, may be used as required (a BB marker is a small metal pellet which can be placed on the bucky as a marker which can help with anatomical orientation on the radiographic image).

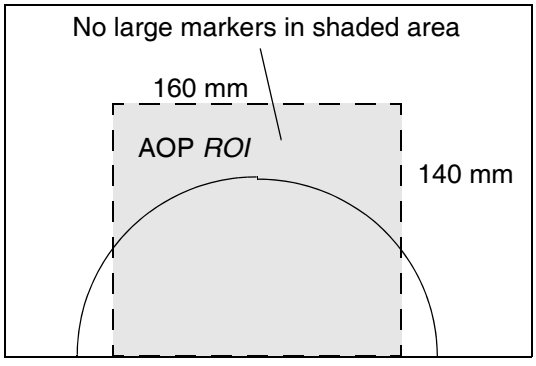
CAUTION

Do not use any radio-opaque markers other than BB markers within the AOP ROI. BB markers having diameters up to and including 1.6 mm diameter may be used. Larger markers will affect the calculation of tissue density, which may lead to a degraded image.

In contact views using AOP and 24 x 31 image size acquisition, the region used to identify the densest part of the breast has an area of 230 mm by 190 mm, is adjacent to the chest wall side, and is centered on the image receptor (the shaded area in the diagram).



In contact views using AOP and 19 X 23 image acquisition, the region used to identify the densest part of the breast has an area of 160 mm by 140 mm, is adjacent to the chest wall side, and is centered on the image receptor (the shaded area in the diagram).



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5-5 Compression

Note:

A warning message to the operator is displayed on the X-ray Console if there is lack of compression (< 3daN) when the operator wants to expose.
If the compression force is less than 3daN, exposure in AOP mode is forbidden.

It is important to use adequate breast compression because the benefits in image quality and dose reduction are significant:

- Compression reduces motion blurring by immobilizing the breast.
- Compression reduces geometric blurring by ensuring direct contact between the breast and the image receptor and by spreading glandular breast tissue.
- Compression reduces scattered radiation and improves subject contrast in proportion to the reduction in thickness of tissue irradiated.
- Compression spreads the breast laterally, giving it a uniform and reduced thickness. This reduces exposure and consequently the mean glandular dose.

5-5-1 Apply compression

To apply compression to the breast, depress the compression footswitch. Manual adjustment can be made using the two knobs, one located on each side of the compression paddle holder. Compress until the breast surface is taut to the touch. Take great care with patients with mammary implants. The compression force appears on the Gantry readout, and can be displayed on the image as an annotation (see Chapter 21 *Viewer*).

The maximum compressive force available using motorized compression is 20 daN. Using manual compression, the maximum force available is between 27 daN and 30 daN with the Arm in the 0° position, reducing to about 20 daN at 90°. An audible warning is given when the limit has been reached.

When using the flexible compression paddle provided with your system, please use the collimator centering light after final compression is achieved and before acquiring the image, to verify that the chest wall side of the paddle is not flexed into the field of view. If the paddle wall is observed in the FOV, please reposition the patient so that her chest wall does not push the paddle wall forward. If that is not possible, switch to the standard compression paddle corresponding to the breast size.

Note:

As a safety measure, the compression system is designed to avoid having the paddle fall in the event of power loss. If power loss occurs during an examination, the current compression force remains applied to the compression paddle. Disengage the patient by lifting the paddle gently using the manual compression knobs. Do not try to lift it quickly.

Note:

Automatic decompression can be programmed to occur when the exposure is terminated, to minimize the time spent under compression by the patient. See section *3 Configuring the X-ray Console set-up menus on page 84* of Chapter 11 *Initial training and set-up*.

Note:

If automatic decompression is not enabled, decompress the patient after the exposure by pressing the compression release button located at the lower right of the X-ray Console.

For 2D localization procedures, automatic decompression MUST BE DISABLED.

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CAUTION

If the compression paddle is not present, take care to leave the space free between the bottom of the paddle holder and the top of the image receptor assembly.

5-5-2 Thickness display

The thickness of the compressed breast is used in determining the average glandular dose (AGD), and for AOP calculations. It appears on the Gantry readout, and can be displayed on the image as an annotation (see Chapter 21 *Viewer*).

- If a valid compression paddle is detected, the actual compression thickness is displayed, whatever the compression force (even if it is lower than the minimum force required for AOP).
- If no compression paddle is mounted or if a non valid compression paddle is detected, the compression thickness display remains blank.
- The compression thickness taken into account by the system for exposure parameters and displayed on the image is the value shown on the Gantry readout when the Operator presses the Prep button on the X-ray Console .

Note:

When making an image with no compression paddle, the compressed breast thickness displayed on the image and recorded in the image file is 45 mm. The ESE and AGD are then computed assuming a breast thickness of 45 mm and an average breast composition.

5-5-3 Dose display

The displayed estimates of the dose to the patient are calculated as follows:

5-5-3-1 Entrance Skin Exposure (ESE)

This quantity is computed using a calibrated model of the free-in-air air-kerma, in the plane of the compression paddle in contact with the breast, with no back-scatter contribution from the breast. It takes into account the attenuation of the x-ray beam by the compression paddle. This quantity is also known as entrance air kerma (ESAK).

5-5-3-2 Average Glandular Dose (AGD)

This conventional quantity is computed from the ESE as described above, using an interpolation of the tables contained in "*Spectral dependence of glandular tissue dose in screen-film mammography*" (Xieng Wu, Gary T. Barnes, Douglas M. Tucker, Radiology 1991; 179:143-148), and "*Molybdenum target-Rhodium filter and Rhodium target-Rhodium filter mammography*" (Xieng Wu, Gary T. Barnes, Douglas M. Tucker, Radiology 1994; 193:83-89).

Note:

When using a spot or biopsy paddle or any other compression device that does not completely cover the breast, the entrance surface of the breast may no longer be a plane, and the distance from focal spot to skin is not clearly defined. In addition, the ESE value is not uniform between parts covered and not covered by the paddle, because of the attenuation caused by the paddle. In such cases, a single accurate value cannot be provided. However, the displayed ESE value continues to be calculated using the same convention as in the regular case.

Note:

When the ESE is not accurate because of the conditions described above, or when the breast is partially irradiated (e.g., due to the collimation being smaller than the breast), the AGD definition is no longer directly applicable. In such cases, the displayed AGD value should be used as an indication only.

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5-6 Image Acquisition

5-6-1 Things to do immediately before taking the exposure

When ready for the exposure, check the image information displayed :

- The Arm angle, if other than 0° (displayed on Gantry readout).
- The magnification factor (e.g., M 1.5), if magnification view is used (displayed on X-ray Console).

5-6-1-1 Select breast Laterality

Select the breast Laterality (right or left). The X-ray Console should now show:

- Laterality (R or L).
- View name (e.g., LCC, RML, LLM, etc.).

Note:

When the patient is positioned for a Cleavage view (CV), external markers must be used to assist in determining Laterality when viewing the image. Place a Right (R) or Left (L) marker in the lateral aspect of the breast of interest, or place markers on the lateral side of each breast. Markers must be placed outside of the 190 mm x 230 mm ROI used by AOP. See section *5-4-2-2 Use of markers in AOP mode on page 76*.

5-6-1-2 Check View name

Check the displayed View name. For special views or recumbent patients, modify the View name manually:

- *Special Views for standing or sitting patients.* See section *5 Core View name modified manually (standing or sitting patients) on page 116* in Chapter 15 *View name selection*.
- *View names for recumbent patients.* See section *6 Core View names for recumbent patients on page 116* in Chapter 15 *View name selection*.

5-6-1-3 Choosing exposure mode (AOP or manual)

AOP Mode

The AOP (Automatic Optimization of Parameters) Mode controls radiation and allows the system to select the main parameters.

It can be used for contact views, magnification views, or for the examination of the chest wall.

Use of AOP mode is not recommended for examinations of patients with mammary implants. Manual mode should be used.

See section *1 AOP - Automatic Optimization of Parameters on page 123* in Chapter 17 *Manual and AOP exposure modes*.

Manual mode

The manual mode can be used for contact views, implant views, magnification views, for the examination of the chest wall, and for examination of biopsy specimens and cores.

You select the following parameters:

- Focal track (Mo, Rh)
- Filter (Mo, Rh)
- kV
- mAs

Note:

By default, the system selects the large focal spot (0.3) when a contact view is selected, and the small focal spot (0.1) when magnification view is selected. Exposures are not possible if these settings are overridden.

See section *3 Manual mode on page 126* in Chapter 17 *Manual and AOP exposure modes*.

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5-6-2 Suggested exposure sequence

To display the acquired images on the AWS LCD monitor in the same order as films hung in the conventional order on a viewbox, it is suggested that patient views should be acquired in the following order:

RCC
LCC
RMLO
LMLO

Note:

When Right/Left image pairs are acquired, it is recommended that the Right image should always be acquired before the Left. This ensures consistent display when using the 2 x 1 view; when the image acquired first is selected, the pair is displayed with the two chest walls in the center of the screen.

5-6-3 Make the exposure

When all parameters are correctly chosen and the patient prepared, make the exposure using the **Prep** and **Exposure** buttons. See section *3-2 Buttons, Switches and Displays detailed description on page 65* in Chapter 8 *X-Ray Console*.

5-6-4 Raw and processed images

After the exposure, the image acquired by the Digital Detector is automatically transferred to the AWS, added to the exam and displayed on the Viewer screen as a raw image.

Processing of the image is started automatically. The processed image is added to the exam and replaces the raw image within a few seconds.

As soon as the processed image has been transferred and displayed on the screen, the system is ready for the next exposure. The images (first raw, then processed) from the new exposure replace the previous image in the Viewer.

For more information on these operations, see Chapter 22 *Image processing and display*.

5-6-5 Modifying contrast (window width) and brightness (window level)

You can choose higher or lower contrast (window width) and brightness (window level) using the View Control contrast and brightness settings (see section *2-2 Contrast and Brightness sliders on page 170* in Chapter 21 *Viewer*).

5-6-6 Check View names and correct if needed

You can check the image for correct View name and Laterality, and change them if necessary. See section *3-5 Change View name on page 178* in Chapter 21 *Viewer*.

6 Acquire other images

Repeat steps above, starting from section *5 Examination: acquire the 1st image on page 74*.

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7 Working with images resulting from an examination

7-1 Quality Check (with or without RRA)

You must examine each image and determine if its quality is satisfactory and qualify it, if necessary, using the Quality Check feature. This may be done with the Repeat and Reject Analysis (RRA) function either enabled or disabled.

See:

- Section *8-3-5 Quality Check on page 143* in section *8-3 Medical Application preferences on page 140* of Chapter 18 *Browser*, that explains the aim of this feature.
- Section *4-5 Quality Check on page 182* in Chapter 21 *Viewer*, that explains how to use this feature.

7-2 Preparation of images for CAD & review

The Viewer allows you to display and manipulate images that have either just been acquired, or recalled from the AWS hard disk for review.

You can display, manipulate and add text or graphic annotations (with measurements) to each image.

For specific information on the Viewer functions, see the table below:

For information on this Viewer function	Which allows you to	Corresponding section in Chapter 21 *Viewer*
View Composition	Display one, two or four images	*2 View Control on page 169*.
Zoom	Magnify a region of a displayed image	*2-1 Zoom on page 169*
Contrast and Brightness	Adjust window width and window level, respectively	*2-2 Contrast and Brightness sliders on page 170*
2D Loc.	Position and display a set of Cross-hairs on a displayed image	*2-3 2D Loc. - electronic Cross-hairs on page 170*
Image Control	Invert/restore image contrast and brightness and to apply one of four auto windowing values	*2-4 Image control on page 171*
Annotation Level	Select the required annotation level	*3-2 Annotation Level on page 174*
Graphics and Measurements	To select and display a measurement tool, add annotations, or hide or erase displayed tools and annotations	*3-3 Graphics and measurements on page 175*
Geometric Transformations	To flip or rotate the image, or return it to its original display	*3-4 Geometric transformations on page 177*

7-3 Transfer images

Go to the Browser and manually push images to the designated DICOM-compatible hosts on the network (see section *7-2 Transfer on page 135* of Chapter 18 *Browser*). Such hosts can be review workstations for post-examination diagnosis.

7-4 Print images

Go to the Browser and manually push images to the designated DICOM-compatible printer on the network (see section *7-2 Transfer on page 135* of Chapter 18 *Browser*).

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8 Store images

Go to the Browser and manually push images to the designated DICOM-compatible hosts on the network (see section *7-2 Transfer on page 135* of Chapter 18 *Browser*). Such hosts can be mass archiving systems.

9 Power off system

According to the **Auto Push** parameter value set in *Medical Application preferences* (see section *8-3-1 Auto Push on page 140* in Chapter 18 *Browser*), images need or not to be manually pushed to remote host(s), as follows:

- Closing the Viewer with Auto Push ON. Images are automatically pushed to remote host(s) before the system is shut down.
- Closing the Viewer with Auto Push OFF. You have to return to the Browser and manually push the images to remote host(s) before the system is shut down.

It is recommended that the system should be shut down at the end of every working day. See section *2 System shutdown on page 90*.

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Chapter 11 Initial training and set-up

Before you can undertake any examination with the Senographe Essential, you must:

- Complete a formal training program,
- Have an account created in the system,
- If you are the very first Operator of the system,set up the X-ray Console menus.

1 Training program

Before to use the Senographe Essential to work with patients, it is mandatory that all users have received adequate training. Contact your GE Healthcare Representative for information on suitable training programs.

For systems subject to Mammography Quality Standards Act (MQSA) rules, the Radiologist, Interpreting Physician, and the Medical Physicist are each required to obtain eight hours of new-modality training for full-field digital mammography.

Additional information can be found on the Food and Drug Administration’s (FDA's) mammography website: *http://www.fda.gov/cdrh/mammography/index.html*.

2 User account

Before the system is put into service, the system administrator must set up suitable **users accounts** for all "**Operators**" (The word "user" belongs to network access management vocabulary and is synonymous with "Operator" used elsewhere in this manual).

Each Operator must enter his or her user name and password to be allowed to access the system.

See Chapter 13 *User session and account management on systems using V1/V2 Control Stations* and *14 User session and account management on systems using V3 Control Stations on page 101*.

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3 Configuring the X-ray Console set-up menus

X-ray Console set-up menus are accessed by using the console *set-up* button (button 3 in section *3 Buttons, switches and displays on page 64*).

See the menu diagram in section *3-1 Access to set-up menus on page 85* for information on using the menus.

The set-up menus allow the Operator:

- To select the language of the console display (menu).
- To use the MEDICAL menu to select operating parameters, including:
  - Decompression:
    Set END OF EXPOSURE DECOMP *to* YES or NO; set height of decompression.
  - Compression:
    - Set max. compression force (highest possible setting is 20 daN for motorized compression or 30 daN for manual compression), although true maximum compression force depends on Arm angle, see section page *5-5-1 Apply compression on page 77*.
    - Set speeds of compression movement (FAST or SLOW):
      Normally set to FAST, i.e.:
      - Down: 7 cm/second (2.76 inch/second), falling to 5 mm/second (0.2 inch/second) on breast contact.
      - Up: 9 cm/second (3.54 inch/second).
      Can be set to SLOW, i.e.:
      - Down: 6 cm/second (2.36 inch/second), falling to 5 mm/second (0.2 inch/second) on breast contact.
      - Up: 3 cm/second (1.18 inch/second).
  - Elevation speed of movement; select FAST or SLOW.
  - Rotation: set default oblique angle; set speed of rotation.
  - Light duration (for stereotaxy operations only): set the default light duration.
- To select a desired View name when working with a recumbent patient (VIEW menu).

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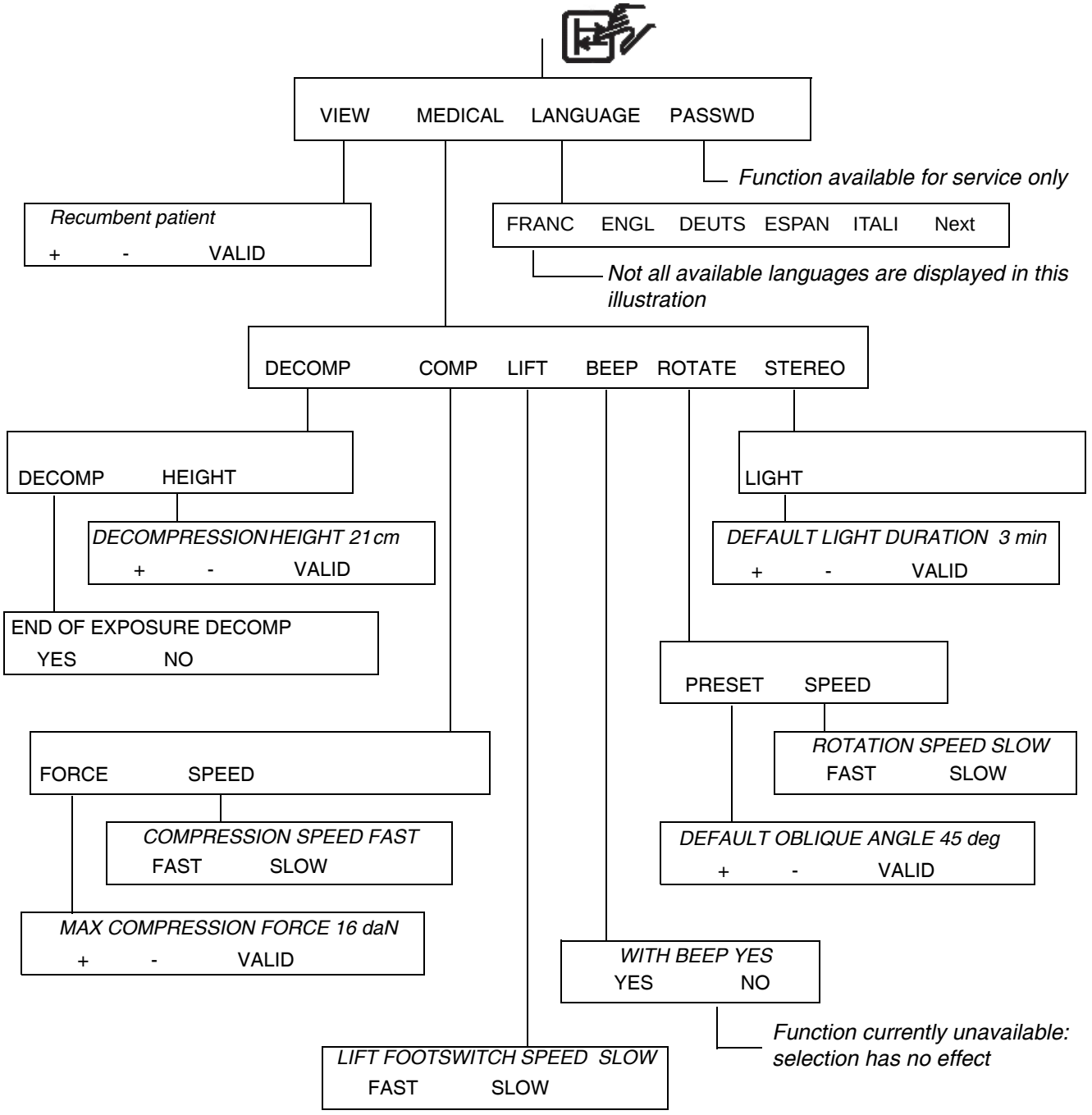
3-1 Access to set-up menus

- With the X-ray Console in normal application mode, press the Setup button to enter the "menu tree" shown below.
- To access a function, press the button below the displayed name of the function.
- To back out of a function (move "up the tree"), press the Setup button again.



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Chapter 12 Startup and shutdown

1 Startup procedure

To power up the system, press the power switch **I** located on the top left of the X-ray Console. Power is applied to the whole system (Gantry, Control Station, Digital Detector, etc.); green power indicators are lit on the Generator, the Control Station, and the AWS LCD monitor.

- A series of system initialization messages appears on the AWS screen, then the *Login:* prompt appears. Type **sdc** (all lower case) followed by **<Enter>**. The AWS login screen shown below appears after a short delay. The AWS login screen that appears depends on whether your system has a V1/V2 Control Station or a V3 Control Station.

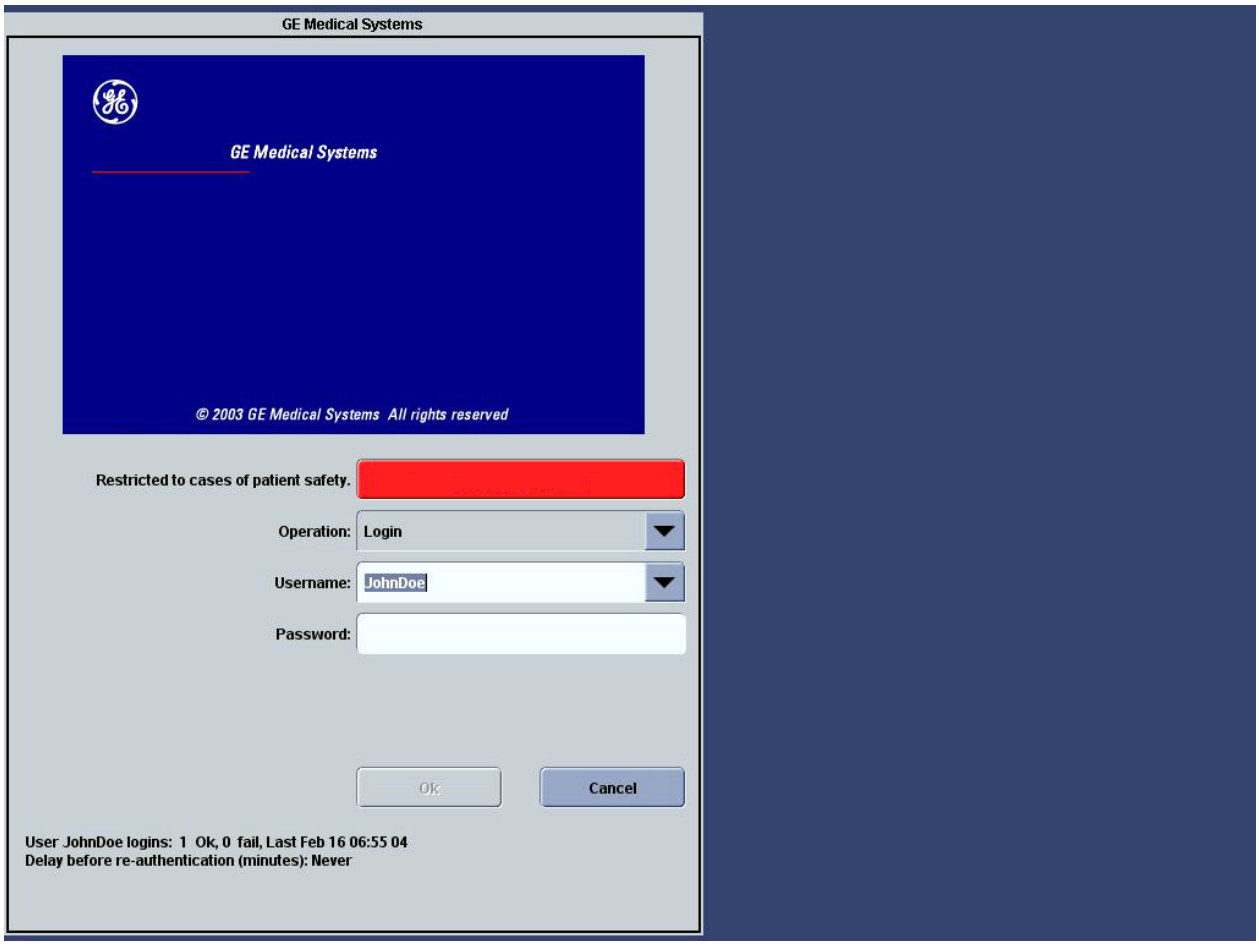

Illustration 1 The AWS login screen for V1/V2 Control Stations

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Illustration 2 The AWS login screen for V3 Control Stations

1-1 Entry for Operators

1-1-1 Definition of users

The word "user" belongs to network access management vocabulary. There are two kinds of user:

- Operator (or Radiologic Technologist) - uses the system to perform examinations via the the medical application interface
- Administrator - administers the users of the system via the administrative interface

When the system is delivered, only one Operator account is available; the user name is *clinical* and the password is *clinical*.

1-1-2 Logging in on systems having a V1/V2 Control Station

- Select **Login** from the *Operation* drop-down menu.
- Enter your user name or select it from the *Username* drop-down menu (click the arrow at the right of the *Username* entry field). Then enter your password as provided by the system administrator in the *Password* field.
- Click the **OK** button.

1-1-3 Logging in on systems having a V3 Control Station

- Enter your user name in the *Login ID* field. Then enter your password as provided by the system administrator in the *Password* field.
- Click the **Login** button.

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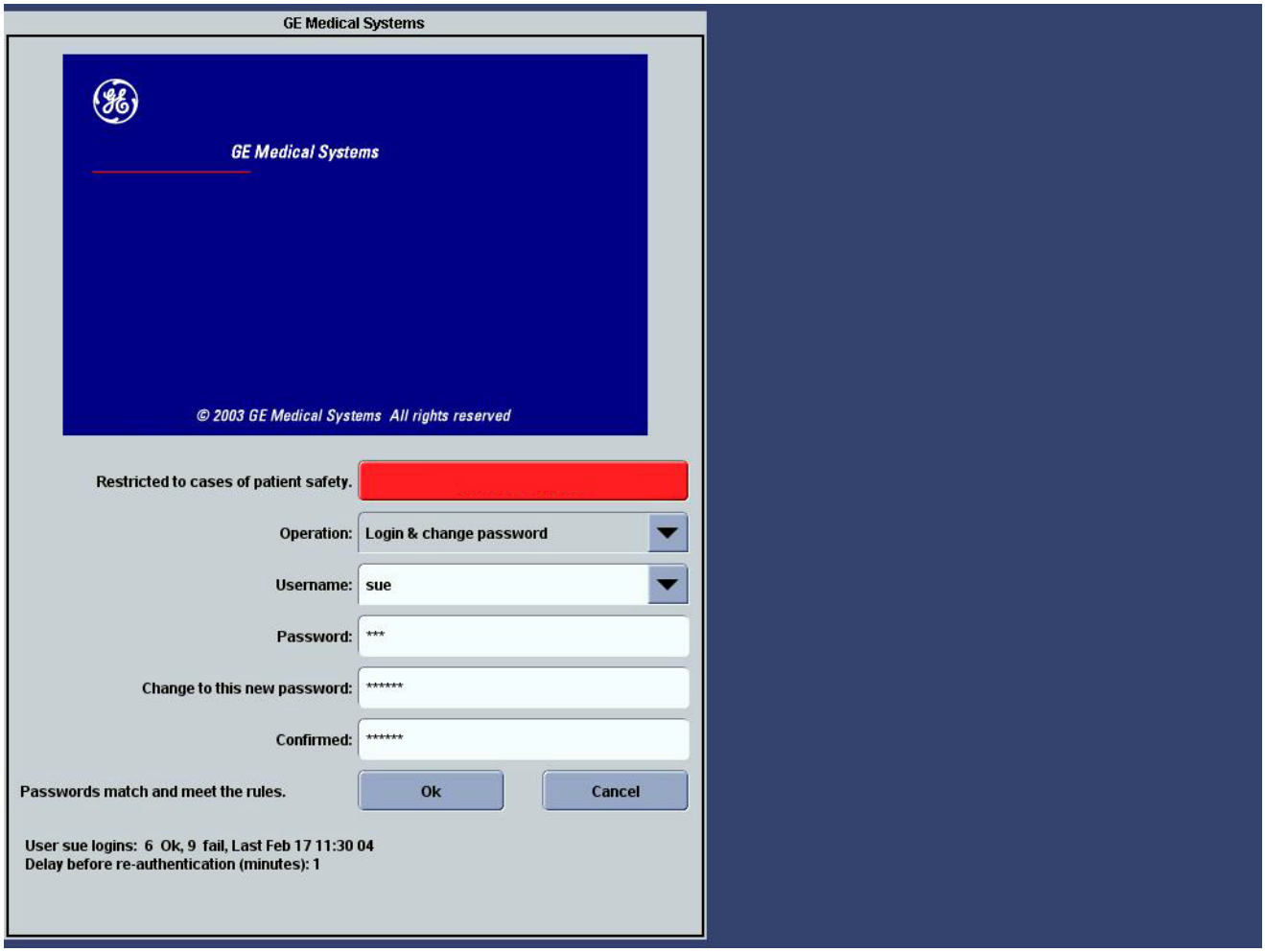
1-2 Change password

1-2-1 Changing passwords on systems having a V1/V2 Control Station

- To change your password, select *Login & change password* from the *Operation* drop-down menu, then enter your current password in the *Password* field to display additional fields as shown below:



- Enter your new password in the *Change to this new password* field.
- Confirm your new password by entering it again in the *Confirmed* field, then click *OK* button.

Note:

Your system administrator may have implemented password constraints. If so, you must comply with the password constraints policy when changing your password, or the system will not allow you to proceed with login.

1-2-2 Changing passwords on systems having a V3 Control Station

To change your password, contact your system administrator. They will change your password according to *4 Changing the password for an existing user on page 105*.

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2 System shutdown

Note:

It is recommended that the system should be shut down at the end of every working day.

To power down the system, click the ***system shutdown*** button located towards the bottom right of the Browser window. A confirmation message appears asking if the entire system should be shut down. If your response is **Yes**, power is removed from the Senographe Essential Gantry and other system components, while the Control Station begins a controlled shutdown, designed to safeguard data. Complete system and UPS shut down takes about two minutes from switch-off.

Note:

The Control Station follows an automatic shutdown procedure, which protects image and patient data. No prompts are displayed. Do not disturb this procedure by attempting to enter commands at this time.

NEVER switch off at the UPS (Uninterruptible Power Supply) except in emergency (risk of data loss).

3 Emergency stop or shutdown

- **In an emergency, to stop Gantry motion:** Press one of the emergency stop push-buttons; there is one on each side of the Gantry Column. After performing a Gantry emergency stop, you can reactivate movement on the Gantry by performing a Gantry reset (See section *Gantry reset on page 90*).
- **In an emergency, to cut power to all system components:** Switch off the main circuit breaker that supplies power from the hospital system to the Senographe Essential system. All image and patient information being processed at the time is lost, and the Conditioner that controls the Digital Detector environment is switched off.

See also section *6-6 Emergency stop and shutdown on page 29* in Chapter 3 *Safety recommendations*.

4 Gantry reset

Certain configuration operations require the Gantry to be switched off and restarted. It is usually desirable to reset the Gantry without disturbing the operation of the Control Station.

- To do this, switch off the Gantry and Generator by pressing the X-ray Console power switch labelled **O** located on the left hand side of the X-ray Console. Switch them on again by pressing the power switch **I**.

5 Generator Cabinet push-buttons

Push-buttons mounted on the Generator cabinet control power to the AWS Cabinet and to the UPS. They are provided for service and emergency use; they should not be used in normal operation.

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Chapter 13 User session and account management on systems using V1/V2 Control Stations

1 Introduction

- When several users (Operators) work regularly on the same Senographe Essential, the system can be set up to provide a separate access for each user (Operator).
- If a system has been set up for multiple users, certain tasks need to be performed regularly, such as management of the list of authorized users, definition of password policies and management of auto-logoff delays.
- To ensure correct coordination, a single person (the *administrator)* should normally perform these tasks.

Note:

The administrator may be the data processing manager for the site, the IT coordinator, or an experienced user. A single user on an individual system may act as his or her own Administrator.

Note:

When the system is delivered two accounts are available:

- A user account; user name clinical, password clinical.
- An administrator account; user name admin, password admin.

- You are recommended to proceed immediately to set up new accounts with new passwords, as described in the following sections.
- The *administrator* is responsible for deleting an account if it is not used.

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2 Opening an administrative session

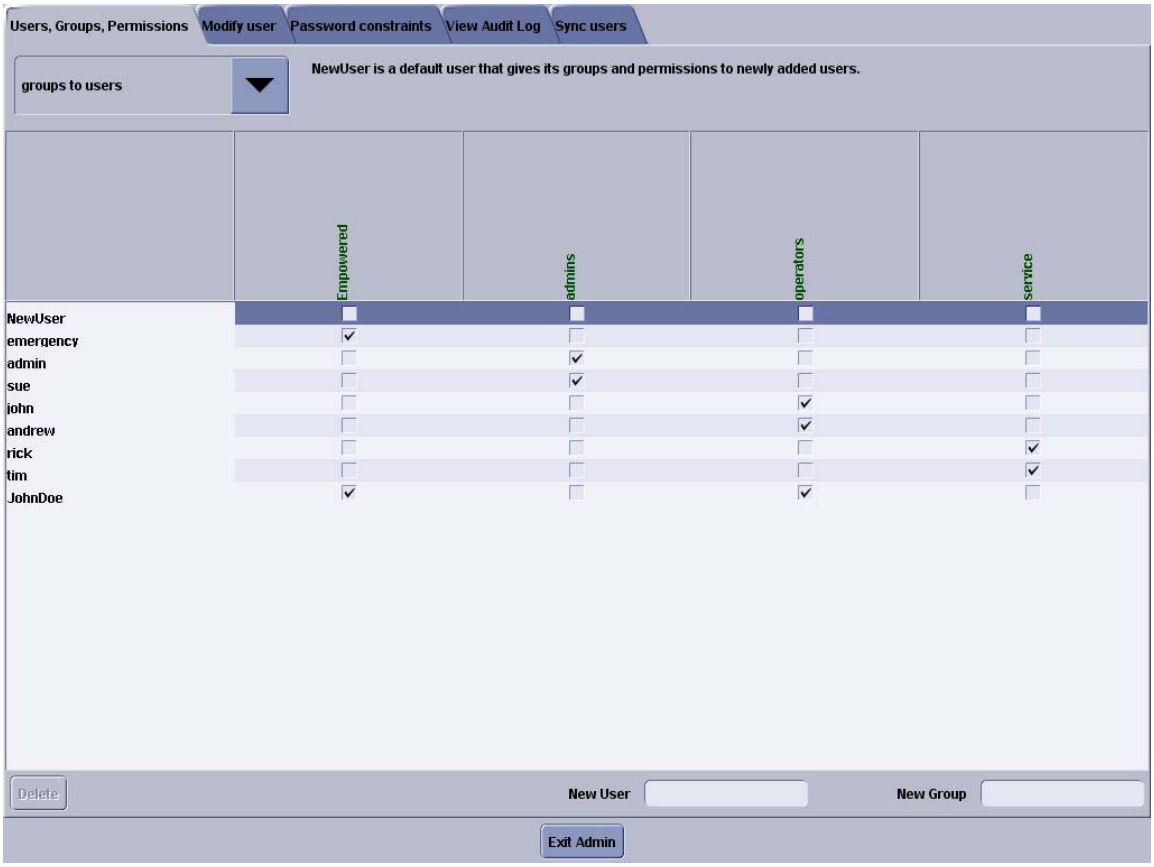
To open an administrative session:

- Power up the system and type **sdc** at the login prompt and press <ENTER>, or logoff from your current session to return to the AWS login screen.
- At the AWS login screen (see section *1 Startup procedure on page 87* in Chapter *12 Startup and shutdown*) log in as **admin** and select **Login & Adminsiter Users** in the *Operation* drop down menu. The factory-set default password for ***admin*** is ***admin***.

Note:

For added security, it is strongly recommended that the designated Administrator should change the default password at the first login.

- The user administration application starts. The available options are selected by clicking the tabs along the top of the screen.
- By default, the tab *Users, Groups, Permissions* is selected when an administrative session is opened, as shown below:



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3 Creating and deleting users

The Senographe Essential has several different types of users: clinical users, administrator users and GE Representative users. Only clinical users can be managed by the system administrator. Clinical users can access the medical application, perform acquisitions, and more generally have access to patient data stored locally on the system.

- To create or delete a clinical user, first open an administrative session and display the default option *Users, Groups, Permissions* (see section *2 Opening an administrative session on page 92*).

3-1 Deleting a user

- Click the user you want to delete in the displayed list so that it appears selected in reverse video.
- Click the Delete button at the bottom left bottom of the screen (not active if no user is selected).
- The user is deleted from the list

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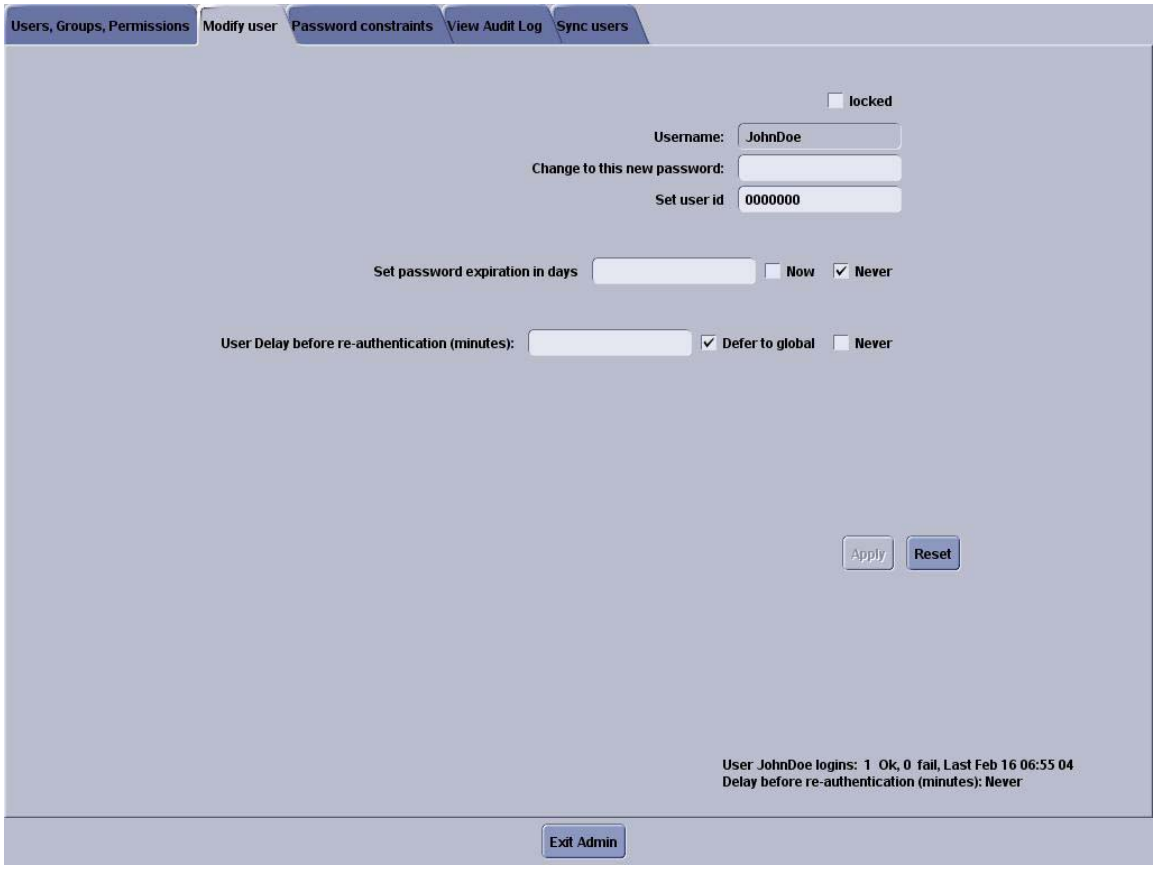
3-2 Creating a user

- To create a new user, enter the new name in the *New user* field at the bottom of the screen, then type <Enter> to validate the new name.
- Click the name of the newly created user in the user list and click the *Modify user* tab to display the screen shown below.
- Enter the desired default password in the *Change to this new password* field.
- Leave the other settings at their default values (*Set user id* is *000000*; *Set password expiration in days* is *Never*, *User delay before re-authentication* is *Defer to global*).
- Click the **Apply** button.



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4 Defining password policies

The administrator can define and customize rules for choosing passwords. He or she can, for example, set a minimum length for the password, require or forbid the use of given characters, etc.

- To define password policies, first open an administrative session (see section *2 Opening an administrative session on page 92*).
- Select the *Password constraints* tab to display the screen shown below.
- Use this screen to customize the password policy that will be used for user logins. You can:
  - Enter the minimum number of characters to be used in the password (*Minimum password length* field).
  - Enter the number of incorrect accesses allowed before the account is locked (*Max bad logins before account is locked* field). See section *5 Lock/Unlock users on page 97* for more information. Note that the default value is 0, which means that there is no limit on incorrect attempts.
  - Choose if the password can or cannot include the user name (*Must not include user name* field).
  - Choose if the password can or cannot start or end with a number (*Must not start or end with a number* field).
  - Choose if the password must include special characters, e.g., ! @ # $ % ^ & * ( ) + (*Must include special* field).
  - Choose if the password must include upper case letters (*Must include upper case* field).
  - Choose if the password must include a number (*Must include number* field).
  - Choose if the user is required to change his or her password at first login (*Must change after create* field).
  - Choose if the user must enter the login, or if the user name can be selected from the drop down menu (*User must type in their username at login* field).
  - Specify a logoff delay *Delay before re-authentication (minutes)*. See section *6 Defining auto-logoff delay on page 97*.

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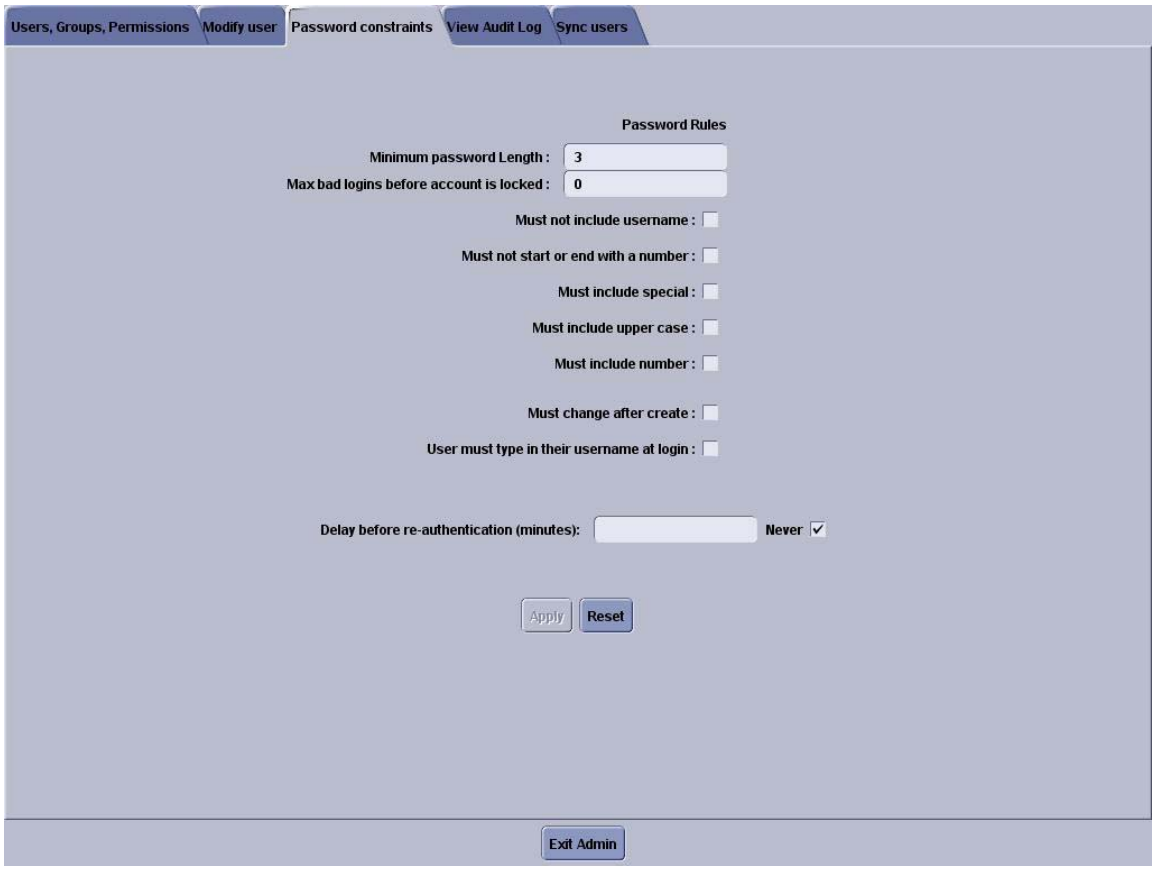
- Click the Apply button to apply the changes made, or the Reset button to cancel them.



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5 Lock/Unlock users

The administrator can define password policies that result in locking an account after a pre-defined number of incorrect login attempts has been detected. A locked account cannot be used until the administrator unlocks it.

- To unlock a user:
  - First open an administrative session and display the default option *Users, Groups, Permissions* (see section *2 Opening an administrative session on page 92*).
  - Click the locked user in the displayed list.
  - Click the *Modify user* tab.
  - Uncheck the ***locked*** check box, and then click the *Apply* button.

The administrator can also lock an account if required.

- To lock a user:
  - First open an administrative session and display the default option *Users, Groups, Permissions* (see section *2 Opening an administrative session on page 92*).
  - Click the user to be locked in the displayed list.
  - Click the *Modify user* tab.
  - Check the ***locked*** check box, and then click the *Apply* button.

  A locked account is not deleted from the system, but the user cannot access the application until the account has been unlocked by the administrator.

6 Defining auto-logoff delay

The administrator can define an auto-logoff delay after which the AWS switches back to the login screen if no activity has been detected on the AWS.

Note:
This delay does not apply if the AWS is in acquisition mode.

- To specify or modify the auto-logoff delay:
  - First open an administrative session and display the default option *Users, Groups, Permissions* (see section *2 Opening an administrative session on page 92*).
  - Click the *Password constraints* tab.
  - Enter the value in minutes of the desired auto-logoff delay in the ***Delay before re-authentication (minutes)*** field at the bottom of the screen.
  - Uncheck the *Never* check box.
  - Click the *Apply* button to apply the changes.

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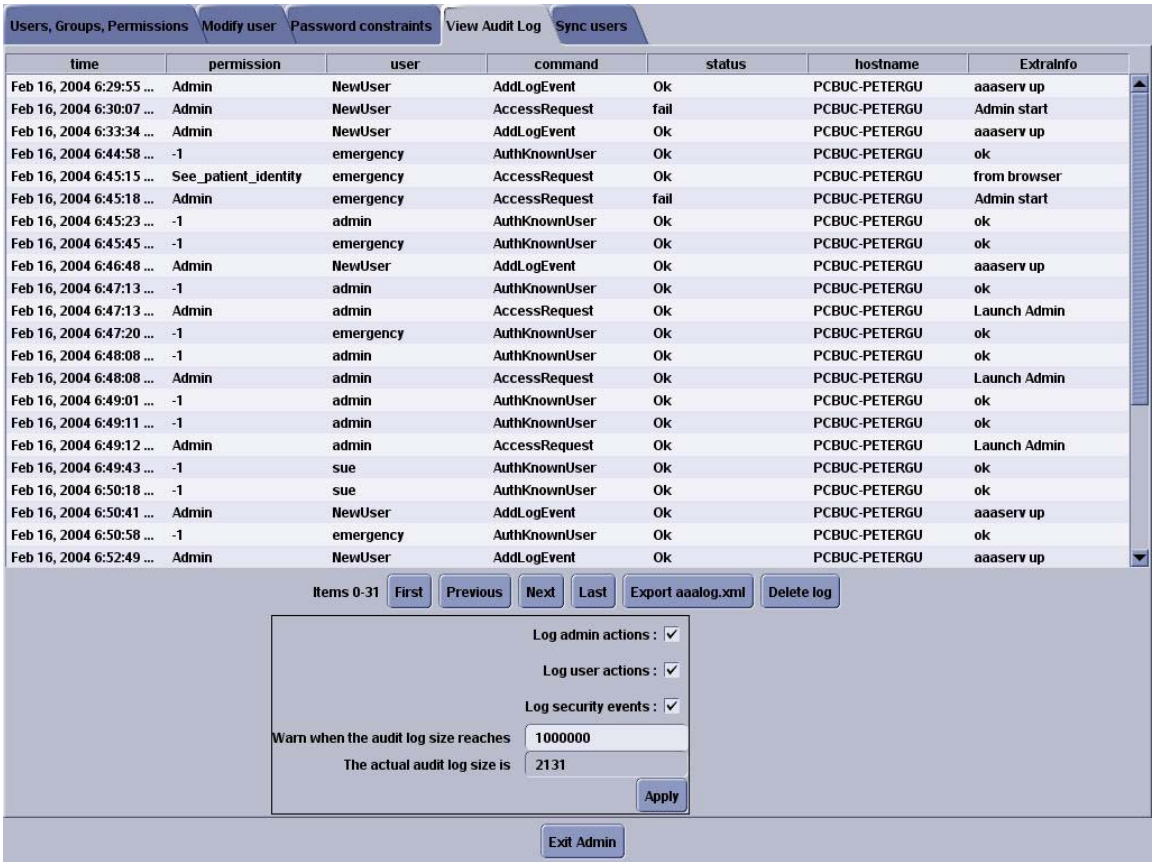
7 Reading and exporting access control log files

Each login attempt of the Senographe Essential is logged by the AWS. The administrator can access and export these log files for auditing purposes.

7-1 Viewing the log files

- To access the log files:
  - First open an administrative session and display the default option *Users, Groups, Permissions* (see section *2 Opening an administrative session on page 92*).
  - Select the *View Audit Log* tab to display the log file screen shown below. The screen shows a list of all login attempts.
  - Use the scroll bar or the ***First***, ***Previous***, ***Next*** and ***Last*** buttons to navigate the log file.
- This log file can be exported to an xml file. See section *7-2 Exporting the log files on page 99*.


Users, Groups, Permissions
Modify user
Password constraints
View Audit Log
Sync users
time permission user command status hostname ExtraInfo
Feb 16, 2004 6:29:55 ... Admin NewUser AddLogEvent Ok PCBUC-PETERGU aaaserv up
Feb 16, 2004 6:30:07 ... Admin NewUser AccessRequest fail PCBUC-PETERGU Admin start
Feb 16, 2004 6:33:34 ... Admin NewUser AddLogEvent Ok PCBUC-PETERGU aaaserv up
Feb 16, 2004 6:44:58 ... -1 emergency AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:45:15 ... See_patient_identity emergency AccessRequest Ok PCBUC-PETERGU from browser
Feb 16, 2004 6:45:18 ... Admin emergency AccessRequest fail PCBUC-PETERGU Admin start
Feb 16, 2004 6:45:23 ... -1 admin AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:45:45 ... -1 emergency AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:46:48 ... Admin NewUser AddLogEvent Ok PCBUC-PETERGU aaaserv up
Feb 16, 2004 6:47:13 ... -1 admin AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:47:13 ... Admin admin AccessRequest Ok PCBUC-PETERGU Launch Admin
Feb 16, 2004 6:47:20 ... -1 emergency AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:48:08 ... -1 admin AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:48:08 ... Admin admin AccessRequest Ok PCBUC-PETERGU Launch Admin
Feb 16, 2004 6:49:01 ... -1 admin AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:49:11 ... -1 admin AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:49:12 ... Admin admin AccessRequest Ok PCBUC-PETERGU Launch Admin
Feb 16, 2004 6:49:43 ... -1 sue AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:50:18 ... -1 sue AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:50:41 ... Admin NewUser AddLogEvent Ok PCBUC-PETERGU aaaserv up
Feb 16, 2004 6:50:58 ... -1 emergency AuthKnownUser Ok PCBUC-PETERGU ok
Feb 16, 2004 6:52:49 ... Admin NewUser AddLogEvent Ok PCBUC-PETERGU aaaserv up
Items 0-31
First
Previous
Next
Last
Export aaalog.xml
Delete log
Log admin actions :
Log user actions :
Log security events :
Warn when the audit log size reaches
1000000
The actual audit log size is
2131
Apply
Exit Admin

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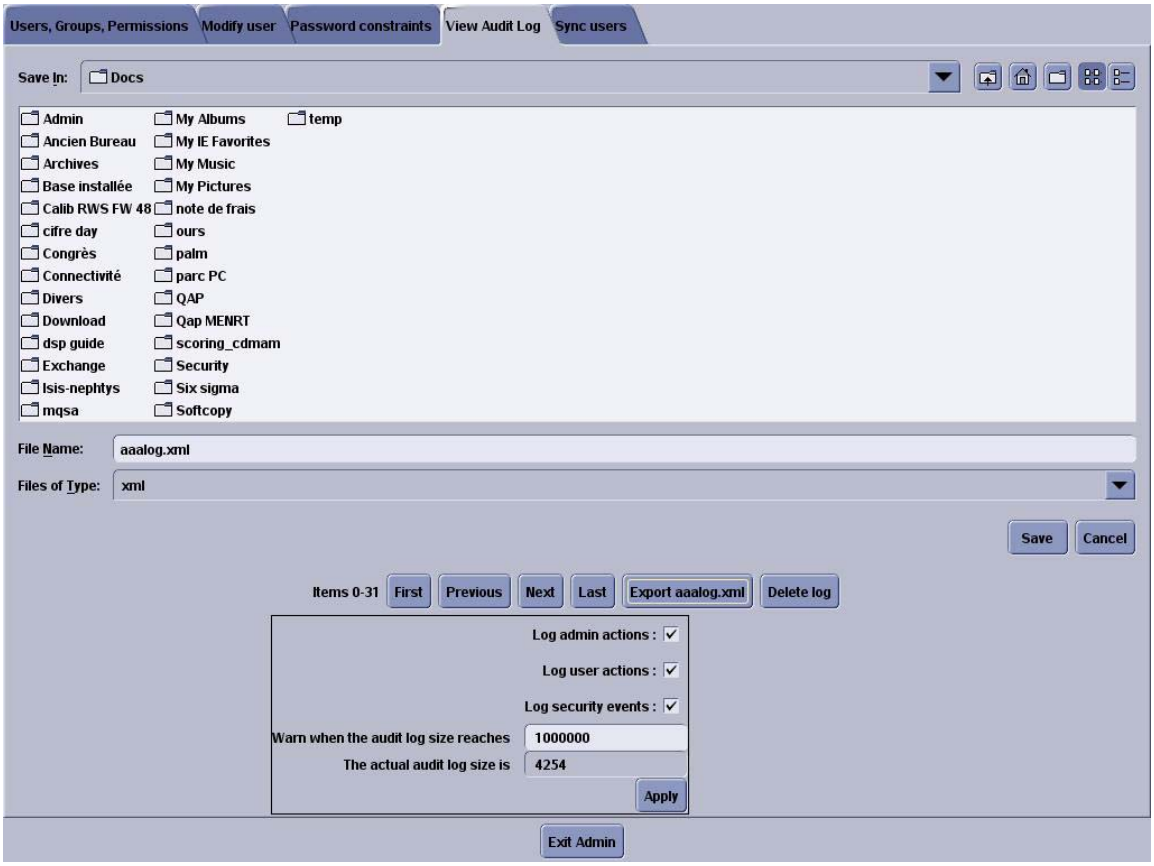
7-2 Exporting the log files

- To export log files, first view the files as described in section *7-1 Viewing the log files on page 98*.
  - Click the *Export aaalog.xml* button to display the file destination selection screen as shown below.
  - After selecting the folder to which the file will be written, modify the file name if required. Click the *Save* button to write the file to the selected destination.



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Chapter 14 User session and account management on systems using V3 Control Stations

1 Introduction

- When several users (Operators) work regularly on the same Senographe Essential, the system can be set up to provide a separate access for each user (Operator).
- If a system has been set up for multiple users, certain tasks need to be performed regularly, such as management of the list of authorized users, and management of the auto-logoff delay for every user.
- To ensure correct coordination, a single person (the *administrator)* should normally perform these tasks.

Note:

The administrator may be the data processing manager for the site, the IT coordinator, or an experienced user. A single user on an individual system may act as his or her own Administrator.

Note:

When the system is delivered two accounts are available:

- A user account; user name clinical, password clinical.
- An administrator account; user name admin, password admin.

- You are recommended to proceed immediately to set up new accounts with new passwords, as described in the following sections.
- The *administrator* is responsible for deleting an account if it is not used.

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2 Opening an administrative session

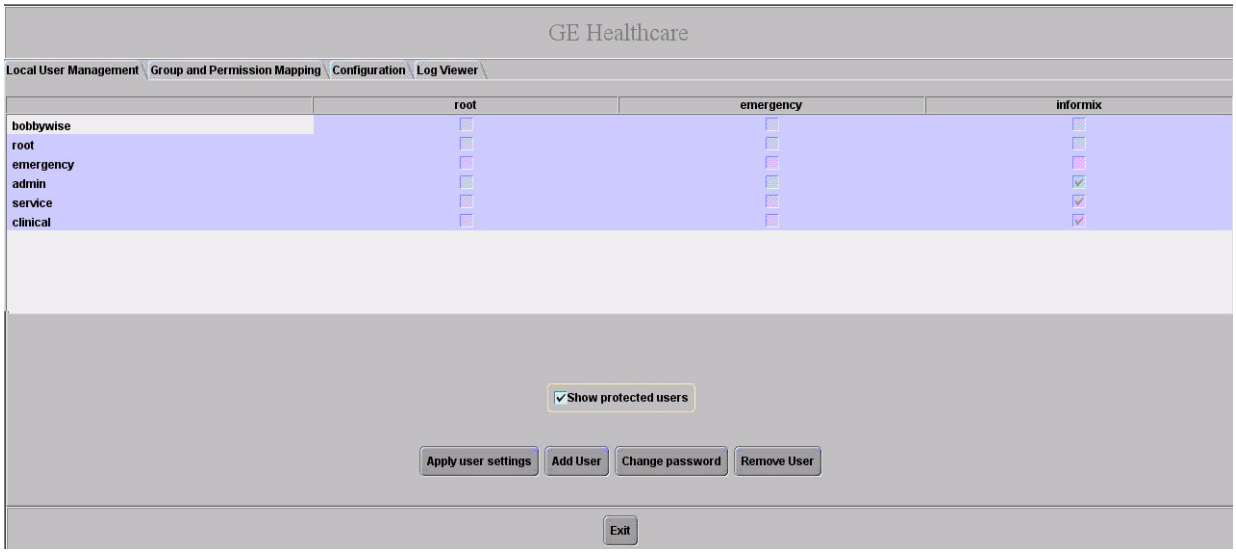
To open an administrative session:

- Power up the system and type **sdc** at the login prompt and press **<Enter>**, or logoff from your current session to return to the AWS login screen.
- At the AWS login screen (see section *1 Startup procedure on page 87* in Chapter *12 Startup and shutdown*) log in as **admin**. The factory-set default password for ***admin*** is ***admin***.

Note:

For added security, it is strongly recommended that the designated Administrator should change the default password at the first login.

- The user administration application starts. The available options are selected by clicking the tabs along the top of the screen.
- By default, the tab *Local User Management* is selected when an administrative session is opened, as shown below:



Ticking/un-ticking the *Show protected users* check box allows you to show/hide the protected system user accounts, which cannot be removed from the system. The protected system user accounts are highlighted in blue.

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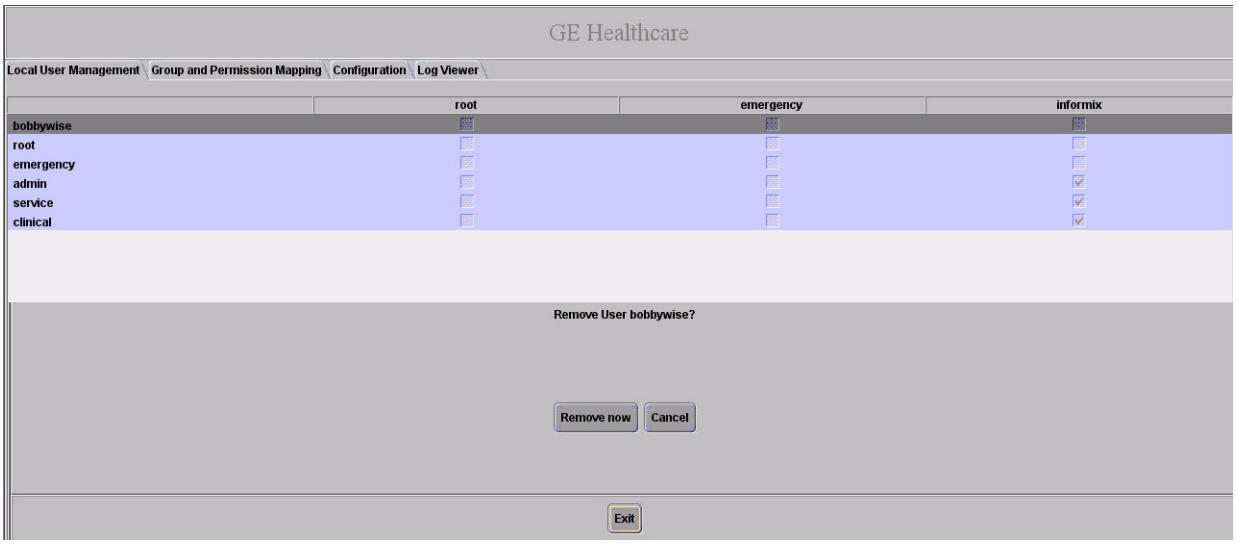
3 Creating and deleting users

The Senographe Essential has several different types of users: clinical users, administrator users and GE Representative users. Only clinical users can be managed by the system administrator. Clinical users can access the medical application, perform acquisitions, and more generally have access to patient data stored locally on the system.

- To create or delete a clinical user, first open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).

3-1 Deleting a user

- Click the user you want to delete in the displayed list so that it appears selected in reverse video.
- Click the **Remove User** button at the bottom of the screen.
- From the *Remove User ?* question that appears at the bottom of the screen, click the **Remove now** button.
- The user is deleted from the list.



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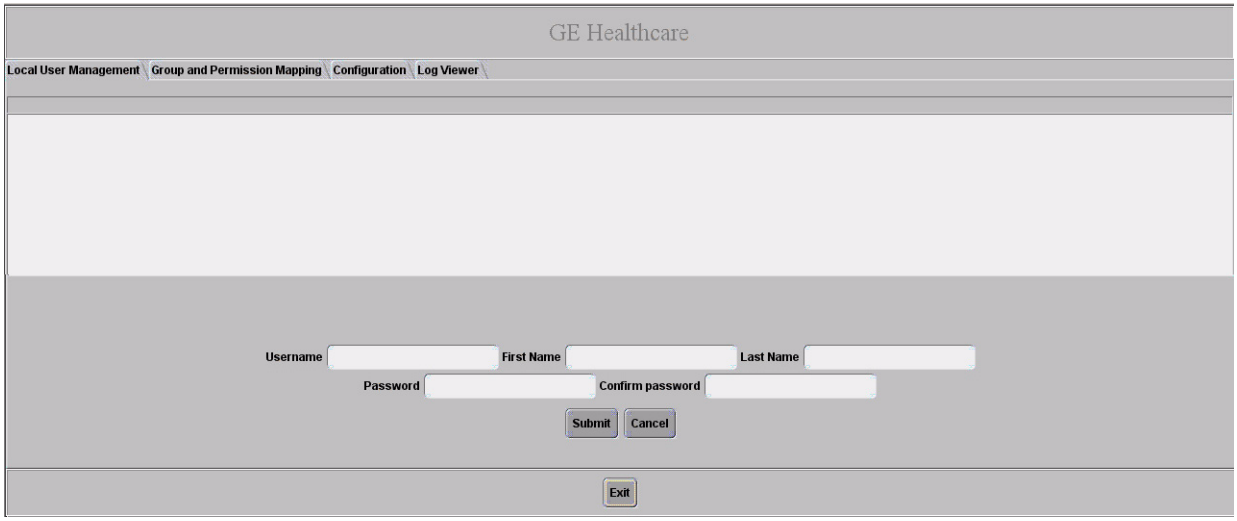
3-2 Creating a user

- To create a new user, click the **Add User** button.
- At the bottom of the screen:
  - Enter the username for the new user in the *Username* field.
  - Enter the first name for the new user in the *First Name* field.
  - Enter the surname for the new user in the *Last Name* field.
  - Enter the password for the new user in the *Password* and *Confirm password* fields.
  - Click the **Submit** button.
- The username of the newly created user appears in the user list.



- By default any user that gets created has does not belong to any group and will have *StandardUser* privileges, meaning they will have access to the medical application interface when they log in. If you want the user to access the administrative interface instead of the medical application interface, refer to *6 Managing groups on page 108*.

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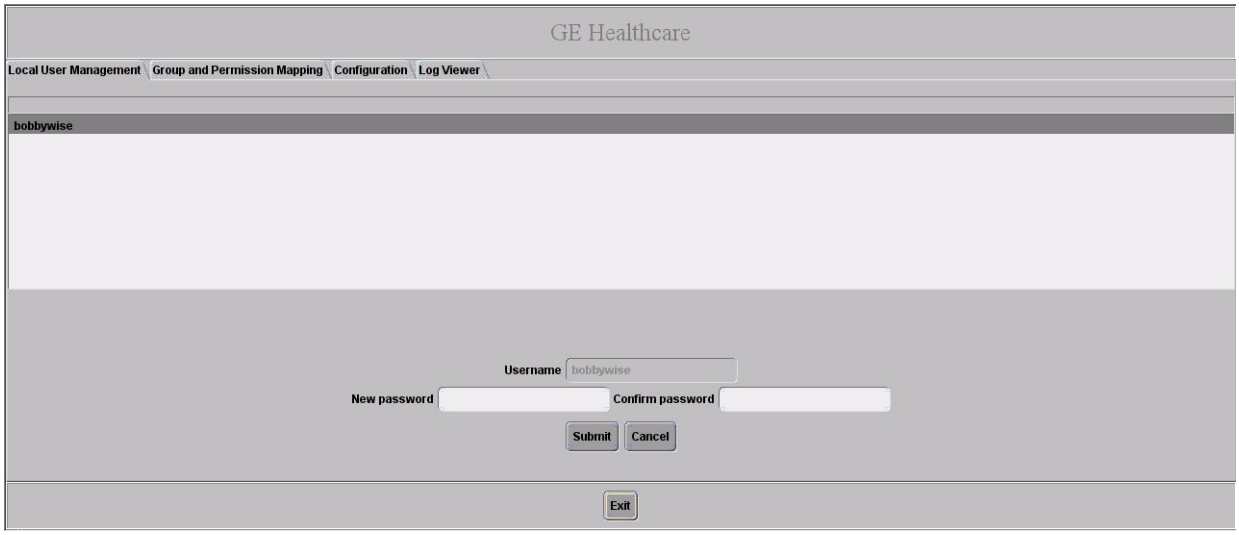
4 Changing the password for an existing user

The administrator can change the password of an existing user.

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the user whose password you want to change in the displayed list so that it appears selected in reverse video.
- Click the **Change password** button at the bottom of the screen.
- Enter the new password in the *New Password* and *Confirm password* fields.
- Click the **Submit** button.



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5 Setting configuration parameters

5-1 Defining auto-logoff delay

The administrator can define an auto-logoff delay after which the AWS switches back to the login screen if no activity has been detected on the AWS.

Note:

This delay does not apply if the AWS is in acquisition mode.

To modify the auto-logoff delay:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the ***Configuration*** tab.
- Enter the value in minutes of the desired auto-logoff delay in the ***Inactivity Timeout (minutes)*** field.
- Click the ***Apply Configuration*** button, then click the **Apply now** to apply the changes.

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5-2 Managing the Emergency Login button on the AWS login screen

The administrator can define whether or not the *Emergency Login* button appears on the AWS login screen. The *Emergency Login* button allows users to login without specifying their credentials. By default, the *Emergency Login* button is not displayed on the AWS login screen.

The *Emergency Login* button must only be displayed in emergency situations (e.g. when an Operator cannot remember their credentials).

To display/hide the *Emergency Login* button appears on the AWS login screen:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the ***Configuration*** tab.
- Tick the **Display Emergency Button** check box to display the *Emergency Login* button, or un-tick the **Display Emergency Button** check box to hide the *Emergency Login* button.
- Click the ***Apply Configuration*** button, then click the **Apply now** to apply the changes.

5-3 Managing the Emergency Prompt

The *Emergency Prompt* is required for system use, and must remain enabled (displayed).

To ensure the *Emergency Prompt* is displayed:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the ***Configuration*** tab.
- Ensure that the **Display Emergency Prompt** check box is ticked.
- Click the ***Apply Configuration*** button, then click the **Apply now** to apply the changes.

5-4 Managing the Enable Authorization feature

The *Enable Authorization* allows remote network access to the Senographe system by users. This feature must be left to its default value of disabled.

To ensure the *Enable Authorization* feature is disabled:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the ***Configuration*** tab.
- Ensure that the **Enable Authorization** check box is un-ticked.
- Click the ***Apply Configuration*** button, then click the **Apply now** to apply the changes.

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6 Managing groups

6-1 Priveleges

The *Group and Permission Mapping* tab of the administrative interface allows you to create groups to which you may assign the following priveleges:

- *GEService*
  - Not functional. Do not use.
- *LimitedUser*
  - Not functional. Do not use.
- *Administrator*
  - This privilege can be assigned to a group.
  - This privelege enables the users in this group to access the administrative interface when they log in.
- *StandardUser*
  - This privilege can be assigned to a group.
  - This privilege is enables the users in this group to access the medical application interface when they log in.

Administrator and StandardUser priveleges should never be assigned together to the same group .

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6-2 Creating groups

If required, you can create a group for either Operators (using the *StandardUser* privilege) or administrative users (using the *Administrator* privilege).

To create a group, proceed as follows:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the **Group and Permission Mapping** tab.
- Click the **Add Group** button.
- In the **Group name to add** field that appears, enter an appropriate name (e.g. administrators if you are creating a group using the *Administrator* privilege or operators if you are creating a group using the *StandardUser* privilege). The **Group name to add** field must contain lowercase letters only.
- Click on the newly created group from the list so that it appears in reverse video, then tick one of the two privileges:
  - *Administrator* - if this group is intended to be for Administrators, who will have access to administrative interface when they log in.
  - *StandardUser* - if this group is intended to be for Operators, who have access to the medical application interface when they log in.
  - Click the **Apply group settings** button, then click the **Apply now** button to apply the selected privilege to that group.

6-3 Removing groups

To create a group, proceed as follows:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the **Group and Permission Mapping** tab.
- Click on the group you intend to remove from the list, so that it appears in reverse video.
- Click on the **Remove Group** button, then click the **Remove now** button.
- The group is deleted from the list.

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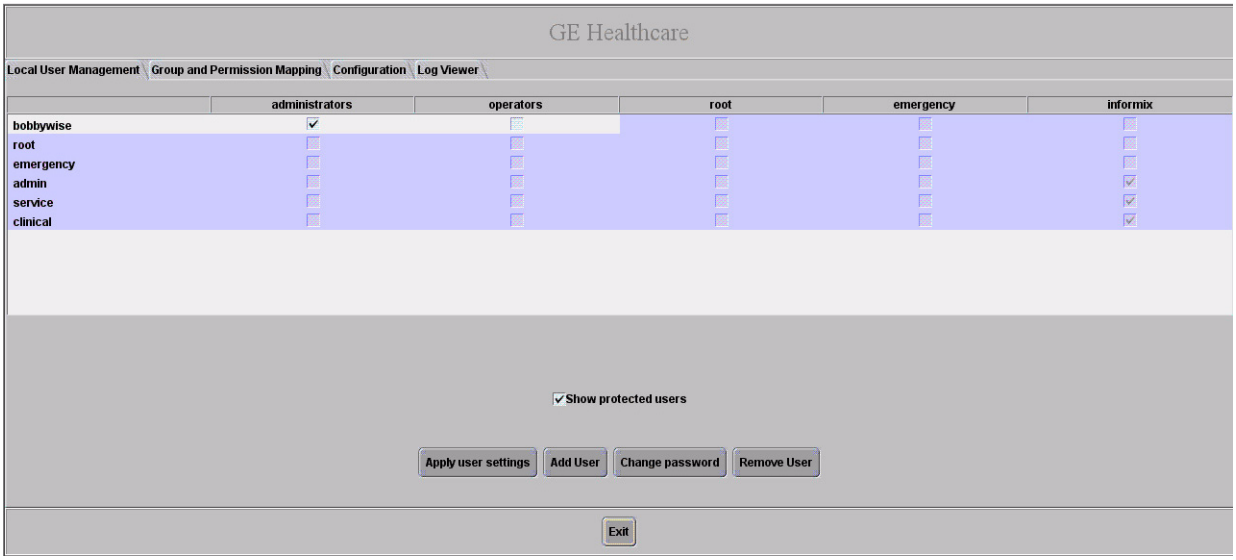
6-4 Assigning users to groups

Once a group exists, you can use the *Local User Management* tab to assign users to a group. Although it is possible, you must never assign a user to more than one group.

To assign a user to a group, proceed as follows:

- First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
- Click the ***Local User Management*** tab.
- Click the user you want to assign a group to, so that it appears selected in reverse video.
- For the selected user tick the group you want the user to be assigned to.
- Click the **Apply user settings** button then click the **Apply now** to apply the changes.



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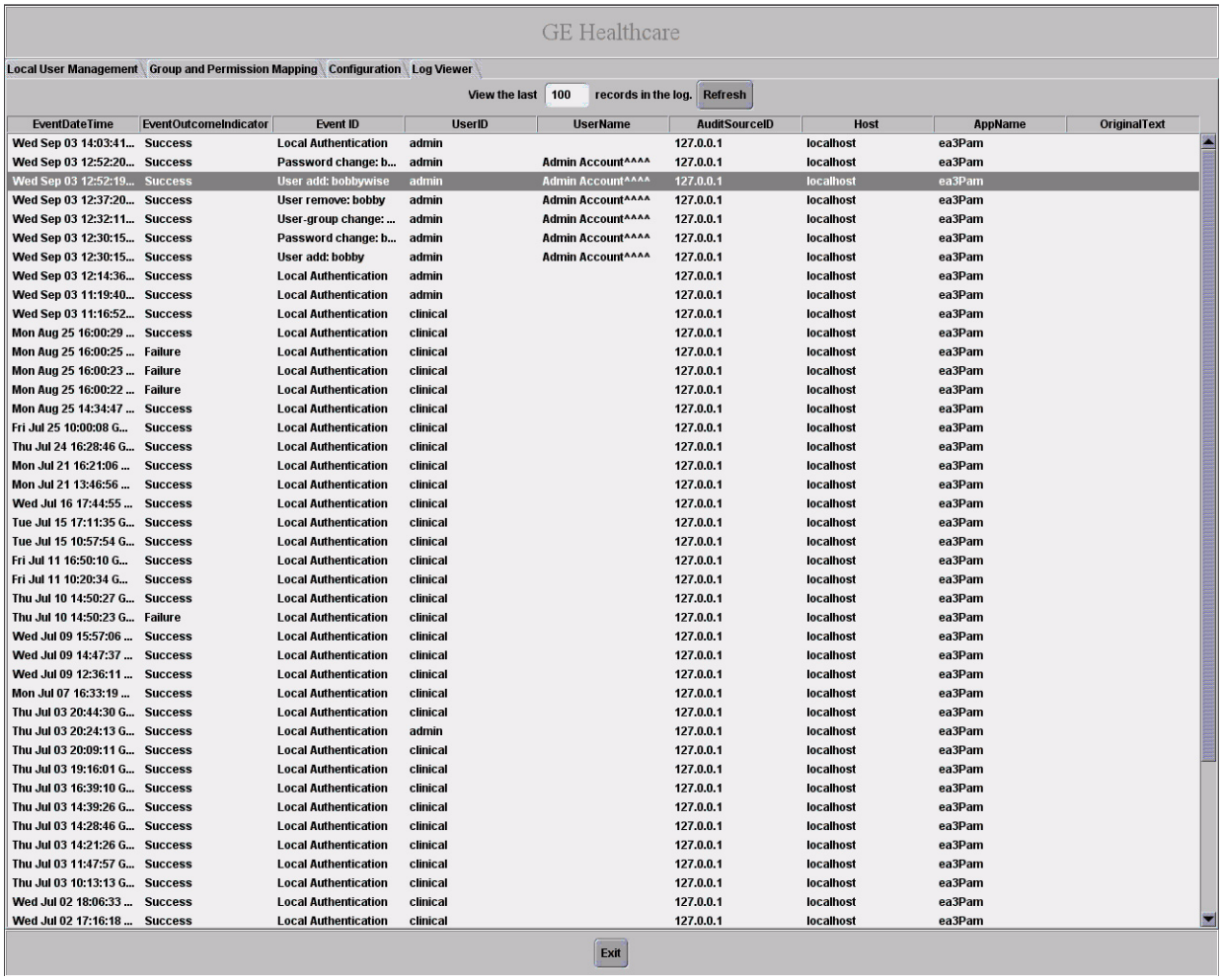
7 Reading access control log files

Each login attempt of the Senographe Essential is logged by the AWS. The administrator can access these log files for auditing purposes.

7-1 Viewing the log files

- To access the log files:
  - First open an administrative session and display the default option *Local User Management* (see section *2 Opening an administrative session on page 102*).
  - Select the ***Log Viewer*** tab to display the log file screen shown below. The screen shows a list of all login attempts.
  - Use the scroll bar to navigate the log file.



EventDateTime	EventOutcomeIndicator	Event ID	UserID	UserName	AuditSourceID	Host	AppName	OriginalText
Wed Sep 03 14:03:41...	Success	Local Authentication	admin		127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:52:20...	Success	Password change: b...	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:52:19...	Success	User add: bobbywise	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:37:20...	Success	User remove: bobby	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:32:11...	Success	User-group change: ...	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:30:15...	Success	Password change: b...	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:30:15...	Success	User add: bobby	admin	Admin Account^^^^	127.0.0.1	localhost	ea3Pam	
Wed Sep 03 12:14:36...	Success	Local Authentication	admin		127.0.0.1	localhost	ea3Pam	
Wed Sep 03 11:19:40...	Success	Local Authentication	admin		127.0.0.1	localhost	ea3Pam	
Wed Sep 03 11:16:52...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Aug 25 16:00:29 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Aug 25 16:00:25 ...	Failure	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Aug 25 16:00:23 ...	Failure	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Aug 25 16:00:22 ...	Failure	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Aug 25 14:34:47 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Fri Jul 25 10:00:08 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 24 16:28:46 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Jul 21 16:21:06 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Jul 21 13:46:56 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 16 17:44:55 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Tue Jul 15 17:11:35 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Tue Jul 15 10:57:54 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Fri Jul 11 16:50:10 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Fri Jul 11 10:20:34 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 10 14:50:27 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 10 14:50:23 G...	Failure	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 09 15:57:06 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 09 14:47:37 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 09 12:36:11 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Mon Jul 07 16:33:19 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 20:44:30 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 20:24:13 G...	Success	Local Authentication	admin		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 20:09:11 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 19:16:01 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 16:39:10 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 14:39:26 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 14:28:46 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 14:21:26 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 11:47:57 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Thu Jul 03 10:13:13 G...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 02 18:06:33 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	
Wed Jul 02 17:16:18 ...	Success	Local Authentication	clinical		127.0.0.1	localhost	ea3Pam	

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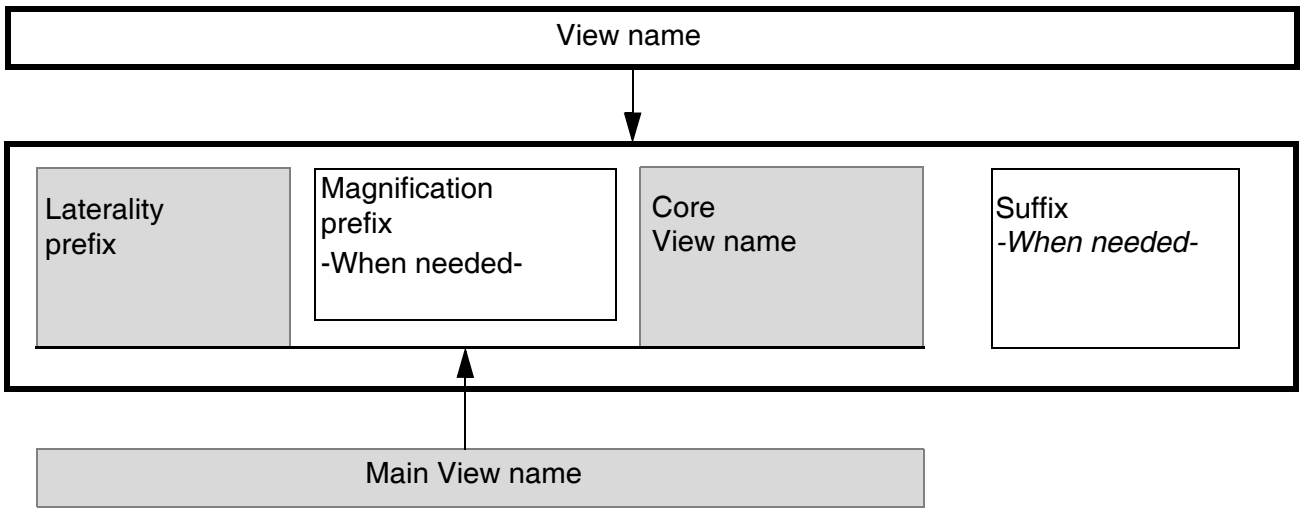
Chapter 15 View name selection

1 Introduction

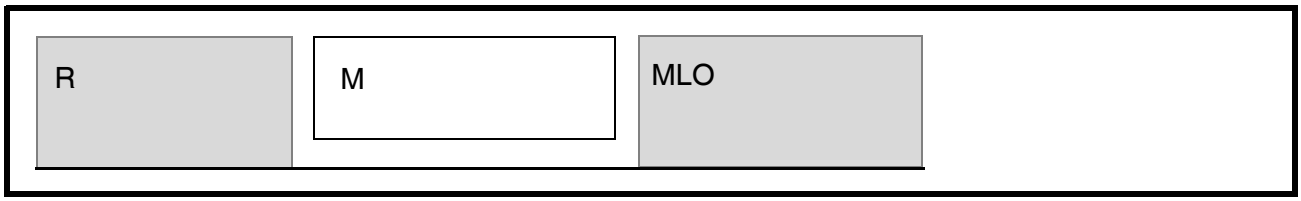
- View names are based on the ACR (American College of Radiology) standardized abbreviations for mammography projection position codes.
- View names are normally selected automatically, according to the selected Laterality, the presence or absence of a magnification stand, and the Gantry angle, as described in section *4 Core View name - selected automatically on page 115*.
- For views that do not correspond to the automatic selection, the Operator must select additional information manually, as described below in sections *5 Core View name modified manually (standing or sitting patients) on page 116* and *6 Core View names for recumbent patients on page 116*.

2 Coding principle

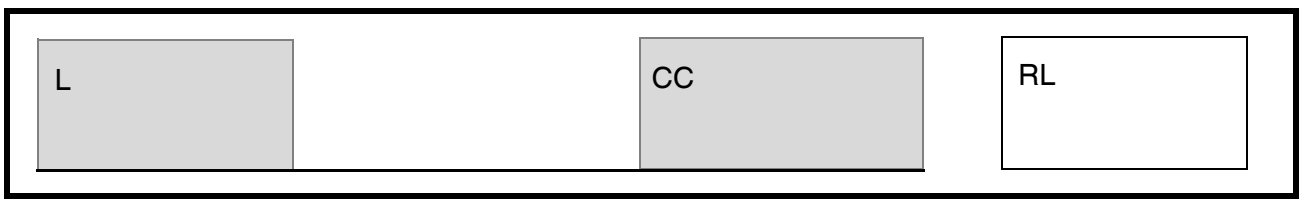
The illustration below explains the coding principle of the View names:



Example 1: Right Magnified MedioLateral Oblique



Example 2: Left CranioCaudal with upper breast tissue Rolled Laterally



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3 .View names code chart

View names used by the Senographe Essential are shown here.

Description	Code	Comment
Laterality - prefix selected by Operator		
Right	R	Laterality selected by Operator
Left	L	Laterality selected by Operator
Magnification - prefix selected automatically		
Magnification	M	Selected automatically if a Magnification stand is present
Core View name - selected automatically - applicable only to standing or sitting patients		
CranioCaudal	CC	Inferior side of breast against receptor
MedioLateral Oblique	MLO	Inferior lateral side of breast against receptor
MedioLateral (90°)	ML	Lateral side of breast against receptor
LateroMedial (90°)	LM	Medial side of breast against receptor
LateroMedial Oblique	LMO	Superior medial side of breast against receptor
CaudoCranial (from below)	FB	Superior side of breast against receptor
Superolateral to Inferiormedial Oblique	SIO	Inferior medial side of breast against receptor
Core View name - selected manually - applicable only to standing or sitting patients		
Exaggerated CranioCaudal	XCCM	As CC with patient rotated medially
Exaggerated CranioCaudal	XCCL	As CC with patient rotated laterally
Cleavage	CV	As CC but inferior side of both breasts against receptor
Axillary Tail	AT	As MLO; axillary breast medially and anteriorly onto receptor
Suffixes added manually - applicable only to standing or sitting patients		
Implant Displaced	ID	Implant pushed back and flattened against chest wall
Tangential	TAN	Area of interest projected close to skin surface
Spot Compression	S	Spot compression with or without magnification
Roll Lateral	RL	Roll the breast slightly in lateral direction
Roll Medial	RM	Roll the breast slightly in medial direction

Prefixes and suffixes are used with the main View names; for example, RMMLO equals Right Magnified MedioLateral Oblique, and LCCRL equals Left CranioCaudal with upper breast tissue Rolled Laterally.

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4 Core View name - selected automatically

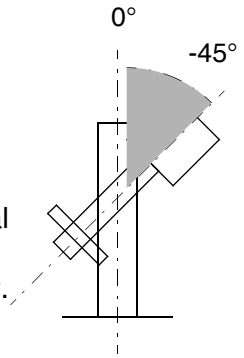
4-1 Principle

1 - Laterality
The Operator selects the breast Laterality, Left or Right.

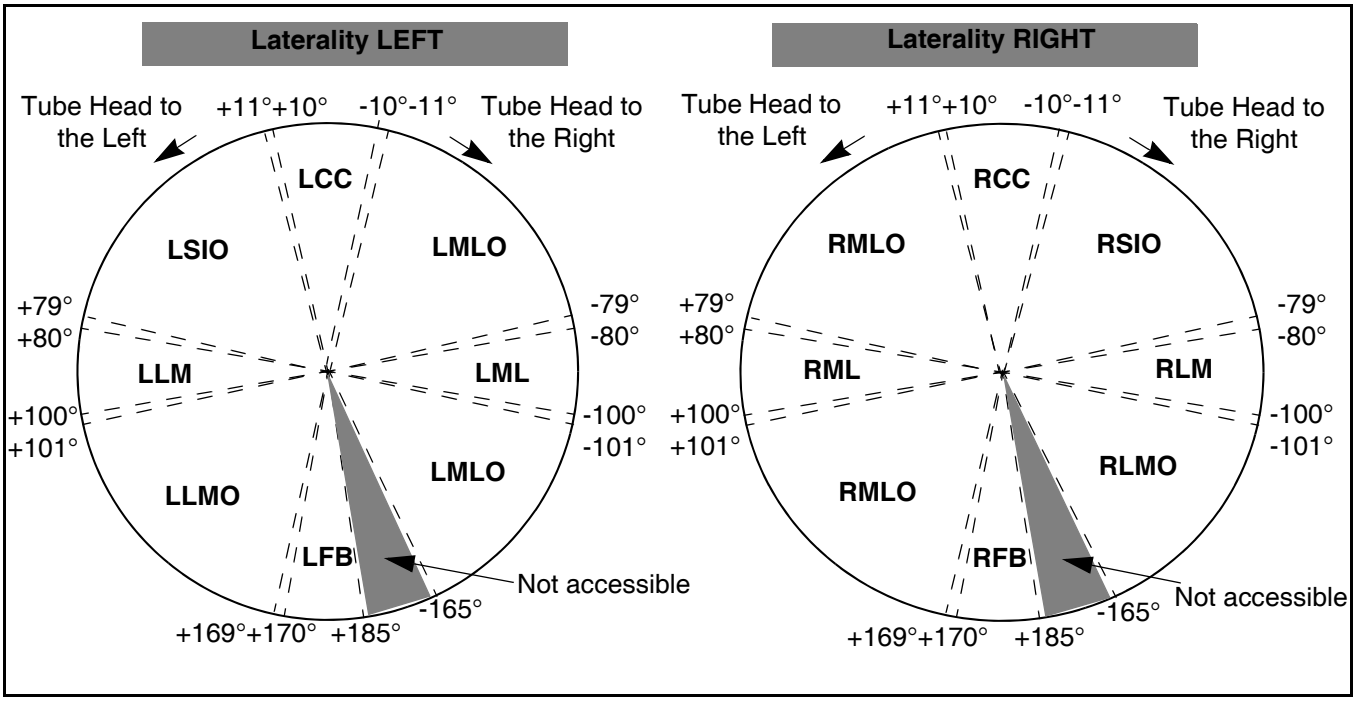
2 - Magnification
The system senses the presence or absence of a magnification stand.

3 - Arm rotation angle
The system selects a View name according to the Arm angle and the Laterality. Default values for the angles used are indicated.

Arm angles are measured from the vertical 0° position, with positive angles counter-clockwise when facing the Gantry. The sketch shows the tube at -45°.



4-2 Core View name codes



4-3 Example

The tube is at **-45°** *and the selected* Laterality *is* ***R****, so the inferior side of the breast is against the receptor. The system therefore selects the View name* ***SIO****, and adds the* Laterality *prefix* ***R****. Because a magnification stand is present, it also adds the prefix* ***M****.*

Operator selected Laterality: R
Magnification stand: Present
Tube angle: -45°

→ **Automatically selected core View name: RMSIO**

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5 Core View name modified manually (standing or sitting patients)

- If a special view is being used which does not correspond to one of the View names selected automatically, use the ***Special Views*** selection button (button 10 in section *3 Buttons, switches and displays on page 64*) to modify the View name. Press the button as often as required until the correct modified name appears. There are two types of modifier:
  - *Modifiers which are added as a suffix:*
    ID, TAN, RL, RM, S (e.g., RCC becomes RCCRM).
  - *Modifiers which replace the standard View names:*
    XCCL, XCCM, or CV replace CC or FB.
    AT replaces MLO.

Note:

When the patient is positioned for a Cleavage view (CV), external markers must be used to assist in determining Laterality when viewing the image. Place a Right (R) or Left (L) marker in the lateral aspect of the breast of interest, or place markers on the lateral side of each breast. Markers must be placed outside of the 190 mm x 230 mm (for 24 x 31 image acquisition) or 140 mm x 160 mm (for 19 x 23 image acquisition) ROI used by AOP (see Chapter 10 *Examination steering guide*).

6 Core View names for recumbent patients

For patients unable to stand or sit for the mammogram, the change of view imposed by the recumbent position means that the automatically selected View name is not correct.
View names for recumbent patients are selected on the X-ray Console *Recumbent patient* menu, accessed by using the *set-up button* as described in section *3 Configuring the X-ray Console set-up menus on page 84*.of Chapter 11 *Initial training and set-up*.

The diagram given on the following page is intended as an aid in selecting appropriate View names for use with recumbent patients.

Each row of the diagram starts with a sketch showing the tube position for one of the main tube angulations. It then gives, first for the Left breast, then for the Right breast:

- The View name corresponding to that angulation for a standing patient. This is the View name which is automatically selected and displayed by the system.
- A sketch showing the path of X-rays through the breast of a recumbent patient with her head to the left, with the corresponding View name. In the *Recumbent patient* menu, press the **-** button as often as required until this View name appears.
- A sketch showing the path of X-rays through the breast of a recumbent patient with her head to the right, with the corresponding View name. In the *Recumbent patient* menu, press the **+** button as often as required until this View name appears.

In each sketch the patient is shown from the rear.

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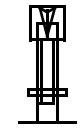
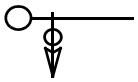
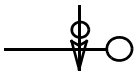
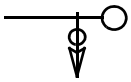
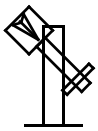
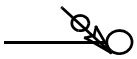
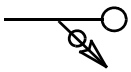
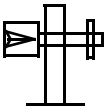
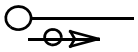
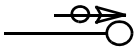
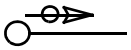
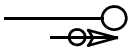
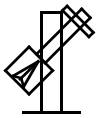
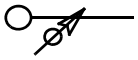
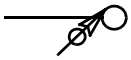
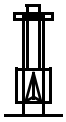
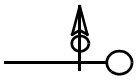
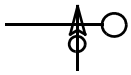
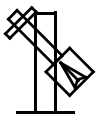
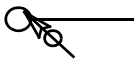
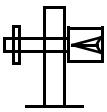
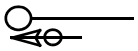
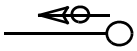
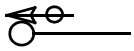
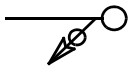
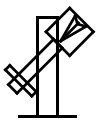
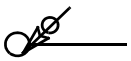
Tube	Patient					
Tube angulation	Laterality Left Breast			Laterality Right Breast		
	Automatic View name selection	Recumbent view		Automatic View name selection	Recumbent view	
		Head to Left	Head to Right		Head to Left	Head to Right
	LCC	LML 	LLM 	RCC	RLM	RML 
	LSIO	LMLO	LLMO 	RMLO	RSIO	(RMLO) 
	LLM	LCC 	LFB 	RML	RCC 	RFB 
	LLMO	LSIO 	(LMLO)	(RMLO)	RMLO	RLMO 
	LFB	LLM	LML 	RFB	RML	RLM 
	(LMLO)	LLMO 	LMLO	RLMO	(RMLO)	RSIO
	LML	LFB 	LCC 	RLM	RFB 	RCC 
	LMLO	(LMLO)	LSIO	RSIO	RLMO 	RMLO

View names displayed in parentheses, e.g. (RMLO), are not used used for medical purposes.

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Chapter 16 Setting FOV size and position

1 Setting FOV size

The first touch to the FOV size button turns the light on and the second starts to change the Field Of View (FOV) to the next available size. Press the FOV size button repeatedly until you obtain the desired FOV size. The FOV size appears on the Gantry readout.

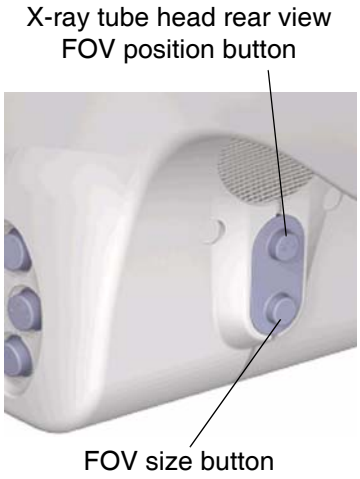

Table 1 FOV SIZES ACCORDING to THEIR POSITIONS

Centered FOV	Off-centered FOV
24x30.7	not possible
19.2x23	19.2x23 Left
	19.2x 23 Right
13x18	13x20.7 Left
	13x20.7 Right
9x9	9x19.05 Left
	9x19.05 Right

To simplify the display for the Operator, only integer values are used for:

- The FOV size indicated on the Gantry readout.
- The FOV size indicated on screen and film annotations. The symbol used to indicate a FOV size in annotations is #.
- The image size indicated on screen and film annotations. The symbol used to indicate an image size in annotations is [ ].

The system works with two image sizes: **24 x 31** when the large field of view size is used, and **19 x 23** otherwise.

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The table below shows, for each actual FOV size, how the FOV size appears on the Gantry readout and the corresponding image size in screen and film annotations.
See also illustration *3 Marking on Bucky - FOV size on page 122*.

Table 2 FOV sizes on the Gantry readout / image sizes in screen and film

Actual FOV size & position	Display on Gantry readout	Screen and Film annotations	
	FOV size & position	FOV size (#)	image size ([])
24 x 30.7 cm	24 x 31	24 x 31	24 x 31
19.2 x 23 cm	19 x 23	19 x 23	19 x 23
19.2 x 23 cm left	19 x 23 Left	19 x 23	
19.2 x 23 cm right	19 x 23 Right	19 x 23	
13 x 18 cm	13 x 18	13 x 18	
13 x 20.7 cm left	13 x 21 Left	13 x 21	
13 x 20.7 cm right	13 x 21 Right	13 x 21	
9 x 9 cm	9 x 9	9 x 9	
9 x 19.05 cm left	9 x 19 Left	9 x 19	
9 x 19.05 cm right	9 x 19 Right	9 x 19	
13 x 23 cm	13 x 23	13 x 23	

2 Setting FOV position

The first touch to the FOV position button turns the light on and the second starts to move the collimated FOV to the next available position. Press the FOV position button repeatedly until you obtain the desired FOV position. Three potential values are available: centered, left and right.

The largest FOV size (24x31cm) in contact views and all field of views in magnification views are centered only. As a result, pressing the FOV position button in these cases has no effect.

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3 Initial FOV size and position - available FOV

- The initial FOV size and position depend on magnification mode (contact view or magnification view), arm angle and paddle type inserted. This means that most of the time, the initial FOV size and position are convenient for the examination being prepared.
- If you are not satisfied with the initial FOV size or position, you can change either one of them by pressing repeatedly the appropriate FOV (size or position) button. Nonetheless, some FOV sizes and FOV positions are only available with certain paddles as shown in the table 4 below.
- The use of a sliding paddle facilitates the positioning of small/medium breasts in angulated views (e.g. choose left position for an LMLO view). If you are using a sliding paddle, choose its position to match the field of view position. To slide the paddle, see section *4-1-4 Modifying the position of a sliding paddle with pre-defined positions on page 42* in Chapter 5 *Gantry*.
- Table 3 below gives the initial FOV size and position automatically taken by the system depending on magnification mode (contact or magnification), Arm angle and compression paddle type inserted.

Table 3 Initial FOV sizes and positions

View mode	Paddle type	Arm angle	Initial FOV at paddle insertion	
			size	position
Contact (1x)	none	any	24x31	centered
	24x31	any	24x31	centered
	2D Spot localization	any	13x18	centered
	2D Large localization	any	19x23	centered
	Sliding 19x23	-10° ≤ angle ≤ +10° or +170° ≤ angle ≤ +185°	19x23	centered
		+11° ≤ angle ≤ +169°		right
		-165° ≤ angle ≤ -11°		left
	Sliding round spot Sliding square spot	-10° ≤ angle ≤ +10° or +170° ≤ angle ≤ +185°	13x18	centered
		+11° ≤ angle ≤ +169°	13x21	right
		-165° ≤ angle ≤ -11°	13x21	left
Magnification (1.5x or 1.8x)	any Magnification paddle : - Round spot magnification - Square spot magnification - 19 x 23 magnification	any	13x23	centered

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Table 4 FOV SIZES AND POSITIONS ACCORDING PADDLE TYPES AND POSITIONS

Mode	Paddle type	paddle position	FOV size & position
contact	all Contact non-sliding view paddles, except the 24 x 31 paddle	centered	24x31, 19x23, 13x18, 9x9
	all sliding paddles	centered	24x31, 19x23, 13x18, 9x9
		Left	19x23 Left, 13x21 Left, 9x19 Left
		Right	19x23 Right, 13x21 Right, 9x19 Right
	24x31paddle	centered	24x31, 19x23, 19x23 Left, 19x23 Right, 13x18, 13x21 Left, 13x21 Right, 9x9, 9x19 Left, 9x19 Right
Mag	all Magnification view paddles	centered	13x23, 13x18, 9x9

Illustration 3 Marking on Bucky - FOV size

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Chapter 17 Manual and AOP exposure modes

1 AOP - Automatic Optimization of Parameters

1-1 Definition of AOP

AOP (Automatic Optimization of Parameters) automates radiation controls by optimizing the exposure parameters.

It can be used for contact exposures, magnified exposures, or for the examination of the chest wall. See section *AOP configuration at installation on page 124* for additional notes on configuration.

Before each exposure made in AOP mode, a brief absorption measurement exposure is made to determine the thickness and density of the breast being examined. This information, together with the priority set by the operator, allows optimization of exposure parameters.

AOP automatically selects the following parameters:

- Anode track (Mo or Rh)
- Filter (Mo or Rh)
- kV value
- mAs value

The exposure is then made, using the track/filter/kV/mAs configuration which supplies the lowest dose with respect for the operator's imaging priority.

1-2 Usage of AOP Mode for Routine Exams (i.e. Non-Stereotaxy Exams)

The operator chooses one of three modes, according to the priority required:

- CNT (Contrast)
  Gives priority to subject contrast.
- STD (Standard)
  Selects a compromise between contrast and dose.
- DOSE (Dose)
  Gives priority to dose reduction.

Note:
By default, the system selects the large focal spot when a contact exam is selected, and the small focal spot when magnification is selected. Exposures are not possible if these settings are overridden.

Note:
GE recommends that Standard (STD) and Dose (DOSE) modes be used for routine mammography. The Senographe DS Contrast (CNT) mode delivers more dose than Standard and Dose modes. GE recommends that Contrast mode be used only after consultation with an interpreting physician or radiologist.

Note:
To fulfill the requirements of certain countries, access to Contrast Mode can be restricted as described in the Service Documentation.

Note:
AOP mode will not work if breast compression is less than 3 daN (30 newtons or 6.7 pounds).

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1-3 Usage of AOP Mode for Stereotaxy Exams

The operator does not have to choose a mode, the system automatically selects the AUTO mode which is an optimized mode for Stereotaxy exams.

For more details about this AOP mode for Stereotaxy exams, please refer to "Senographe Essential Stereotaxy - Operator Manual ".

1-4 AOP configuration at installation

1-4-1 Classic Tables versus Profile Tables

For each AOP mode, two sets of optimized exposure parameters are available on the Senographe. These are called Profile Tables and Classic Tables.

The Profile Tables have been created to provide an additional way to manage the trade-off between image quality and patient dose by changing some of the selections of exposure parameters for particular breast thickness and composition combinations. The changes in exposure parameter selection are expected to affect Contrast to Noise Ratio (CNR) and Average Glandular Dose (AGD).

It is important to understand that any improvement in CNR is done at the cost of an increase in AGD and vice versa; a reduction in AGD yields a diminished CNR. If the site operates in the Contrast mode, and the emphasis is on imaging mid-sized breasts, Classic Tables may be preferred. If the emphasis is on imaging larger breasts, Profile Tables may be preferred. If the site operates in the Standard or Dose mode, and the emphasis is on imaging larger breasts, Profile Tables may be preferred. It is the radiologist's responsibility to make the choice between configuring Profile Tables or Classic Tables.

1-4-2 Configuration process

At installation, one table or the other must be configured for each AOP mode. The Field Engineer must set the desired configuration. Note that this choice may be constrained due to regulations in force in certain countries. These are explained in the Service Manual, and can be discussed with the Field Engineer.

Once the Senographe is installed, should you need to know which of the tables have been set; please contact your Field Engineer.

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2 AOP mode

The AOP (Automatic Optimization of Parameters) Mode controls radiation and allows the system to select the main parameters.

It can be used for contact views, magnification views, or for the examination of the chest wall.

Before each exposure made in AOP mode a brief absorption measurement exposure is made to determine the thickness and density of the breast being examined. This information, together with the priority that you have set, allows optimization of exposure parameters. The exposure is then made, using the track/filter/kV/mAs configuration which supplies the lowest dose with respect for the imaging priority.

You choose one of three options, according to the priority required:

- CNT (Contrast)
  Gives priority to subject contrast.
- STD (Standard)
  Selects a compromise between contrast and dose.
- DOSE (Dose)
  Gives priority to dose reduction.

Note:

GE Healthcare recommends that Standard (STD) and Dose (DOSE) mode be used for routine mammography. The Contrast (CNT) mode delivers more dose than Standard and Dose modes. GE Healthcare recommends that CNT mode be used only after consultation with an interpreting physician or radiologist. If desired, access to CNT mode can be restricted as described in the Service documentation.

Breast compression of at least 3 daN is mandatory when using the AOP mode.

AOP automatically selects the following parameters:

- Anode track (Mo or Rh)
- Filter (Mo or Rh)
- kV value
- mAs value

By default, the system selects the large focal spot when a contact view is selected, and the small focal spot when magnification view is selected. Exposures are not possible if these settings are overridden.

Use of **AOP** mode is **not** recommended for examinations of patients with **mammary implants: manual** mode should be used instead.

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3 Manual mode

The manual mode can be used for contact views, implant views, magnification views, for the examination of the chest wall, and for examination of biopsy specimens and cores.

The Operator selects the following parameters:

- Focal track (Mo, Rh)
- Filter (Mo, Rh)
- kV
- mAs

Note:

By default, the system selects the large focal spot (0.3) when a contact view is selected, and the small focal spot (0.1) when magnification view is selected. Exposures are not possible if these settings are overridden.

Select the desired track/filter configuration according to the thickness and density of the breast to be examined, then select suitable kV and mAs values.

Note that while the examination of a very dense breast using the rhodium or molybdenum tracks provides similar contrast images, the same breast examined via the rhodium track benefits from better tissue visualization and a lower average glandular dose.

See table *1 Suggested manual techniques for routine exams (i.e. Non-Stereotaxy exams) on page 127* below for suggested parameters according to breast type and thickness. These suggested parameters are valid for routine exams (i.e. Non-Stereotaxy exams).

See table *2 Maximum and recommended kV ranges on page 127* for available maximum and recommended kV ranges.

For thick (>6 cm) or dense breasts, the Mo/Rh and Rh/Rh configurations may provide equivalent or better image quality with reduced patient dose.

Although subject contrast depends on the kV value used, note that an increase in the kV value may reduce the radiation dose to the patient. Potential contrast losses will be handled by digital image processing.

A reduction in the kV value improves contrast but increases the radiation dose to the patient.

Increasing the kV setting by 1 or 2 kV will reduce exposure time.

In manual mode, the choice of priority to dose reduction or to the desired contrast is left to the discretion of the Operator.

Note:

If the Operator makes a filter selection error, the system automatically changes the filter. A warning message appears on the first line of the X-ray Console readout.

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Table 1 Suggested manual techniques for routine exams (i.e. Non-Stereotaxy exams)

Compressed breast thickness (mm)	Homogeneously fatty			50% fatty, 50% dense			Homogeneously dense		
	Target/ Filter	kVp	mAs	Target/ Filter	kVp	mAs	Target/ Filter	kVp	mAs
With grid (contact view):									
< 30	Mo/Mo	25	32	Mo/Mo	26	28	Mo/Mo	26	36
30-40	Mo/Mo	26	36	Mo/Rh	26	45	Mo/Rh	27	50
40-50	Rh/Rh	28	50	Rh/Rh	29	56	Rh/Rh	29	63
50-60	Rh/Rh	29	56	Rh/Rh	29	63	Rh/Rh	30	71
60-70	Rh/Rh	29	71	Rh/Rh	29	80	Rh/Rh	30	80
70-80	Rh/Rh	29	80	Rh/Rh	30	90	Rh/Rh	31	80
> 80	Rh/Rh	30	90	Rh/Rh	30	140	Rh/Rh	31	140
Without grid (magnification view):									
< 30	Mo/Mo	25	25	Mo/Mo	26	36	Mo/Mo	27	56
30-40	Mo/Mo	26	36	Mo/Mo	27	56	Mo/Rh	27	63
40-50	Mo/Rh	28	56	Rh/Rh	29	71	Rh/Rh	30	71
50-60	Rh/Rh	29	71	Rh/Rh	30	80	Rh/Rh	31	71
60-70	Rh/Rh	30	71	Rh/Rh	31	80	Rh/Rh	32	80
70-80	Rh/Rh	31	80	Rh/Rh	32	90	Rh/Rh	33	80
> 80	Rh/Rh	32	80	Rh/Rh	33	110	Rh/Rh	35	125

Table 2 Maximum and recommended kV ranges

TRACK	FILTER	KV RANGE	
		MAXIMUM	RECOMMENDED
Mo	Mo	22 thru 32	25 thru 28
Mo	Rh	22 thru 40	26 thru 30
Rh	Rh	25 thru 49	28 thru 35

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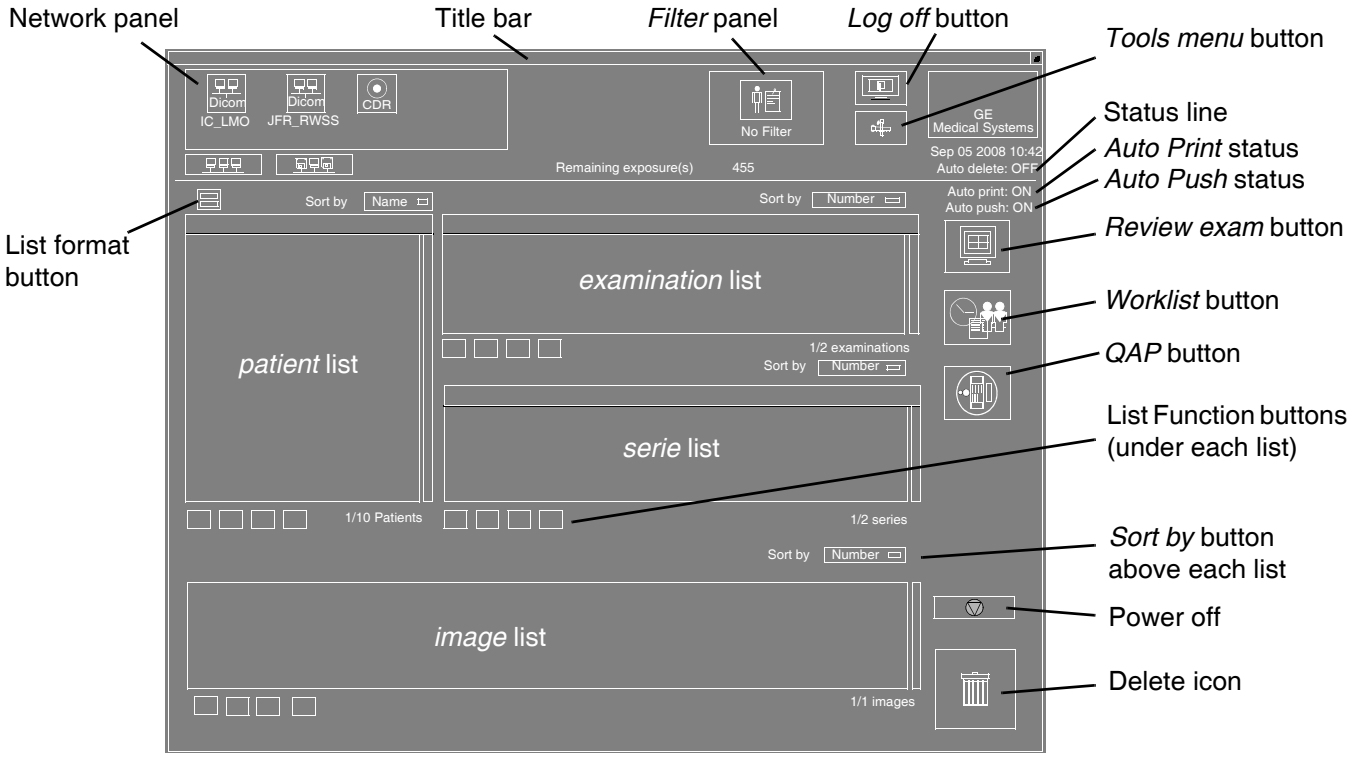
Chapter 18 Browser



1 Overview

The Browser window illustrated above (usually called “the Browser”) appears when the Senographe Essential system is first switched on and the Operator has logged in. Note that the Tools menu function (section *8 Tools menu utilities on page 137*) allows a number of Browser display options, so the windows and icons displayed may differ from those shown here.

The Browser is used to:

- Shut down the Senographe Essential system.
- Link with the HIS/RIS/MIS (Hospital/Radiology/Mammography Information System).
- Access the Worklist for setting up and starting patient examinations.
- Select images in the AWS database for review.
- Manage the database (in particular to remove images that are no longer required).
- Transfer images to other Workstations.
- Save images on recordable CDs for data interchange.
- Archive images (if the optional mass archiving system is present).

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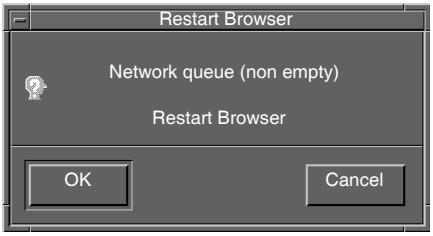
2 Browser restart

If it is necessary to restart (reset) the Browser, proceed as follows:

- Place the cursor in the title bar at the top of the Browser window.
- Use the left mouse button to drag the window down, leaving a blank space on the screen above the window.
- Place the cursor in the blank space; click the right button.
- Select **Restart Browser** from the pop-up menu.

If *Network*, *Printing*, or *Save* operations are in progress, a warning box appears, allowing you to proceed with the restart or to cancel it. Jobs in progress are interrupted and may be lost when the Browser is restarted. Network transfers are stopped, but are automatically retried after the restart. Printing and save operations are stopped, and must be launched again after the restart. Note that interrupted save operations to a CD-R may result in a partially saved file on the CD-R; the CD-R will be unusable and must be replaced before the operation is repeated.



3 System shutdown

- To shut down the Senographe Essential system, click the *Power off* icon at the lower right of the Browser window. Power is removed from the Gantry and Generator; the Control Station follows a shutdown procedure lasting about two minutes, designed to ensure that no information is lost.

4 Log off

- This function may be used to prevent access by unauthorized persons to the system and locally stored patient data, especially between two acquisitions.
- To use the function, click the *Logoff* icon at the top right of the Browser. The system returns to the AWS login screen (see section *1 Startup procedure on page 87* in Chapter 12 *Startup and shutdown*). Follow the usual login procedure to resume operation.

- The system administrator can configure the system to log off automatically after a chosen delay.

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5 Browser display

5-1 Date Display

The date displayed on Browser is in English, regardless of the language of the system.The format of displayed date is the month (first three letters), the day (two digits) and the year (four digits), i.e.: MMM DD YYYY. The following table gives the English abbreviations of month names:

Month	English Abbreviation
January	Jan
February	Feb
March	Mar
April	Apr
May	May
June	Jun
July	Jul
August	Aug
September	Sep
October	Oct
November	Nov
December	Dec

5-2 Lists

The Browser contains lists showing the patients, examinations, series, and images presently on the internal disk system:

- Patients list: patients for whom examinations are stored on the internal disk system.
- Examinations list: Examination for the selected patient.
  Note: examinations are sometimes referred to as studies.
- Series list: The different series of images within the selected examination; Raw, Processed, and Screen Save images.
- Images list: images within the selected series.

The number of items (patients, examinations, series, or images) currently selected, and the total number of items contained in the list, appears at the lower right corner of each list.

In addition to raw and processed images acquired locally by the AWS, the Browser lists may also include Secondary Capture (SCPT) images.

5-3 List format

- The Browser displays lists of patients, exams, etc., in the following two formats:
  - Two-list format; patients, and examinations.
  - Four-list format: patients, examinations, series, and images.
- To change from one format to the other, click the appropriate small icon (list format button) just above the patients list.

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5-4 Application controls

The application control buttons to the right of the Browser lists are used to review images stored on the AWS database, to start Quality Assurance Procedures (QAP), or to input patient demographics from the HIS/RIS.

- To review images stored on the AWS: select the desired images on the Browser, then click the ***Review exam*** button.

- To link with the HIS/RIS and access the Worklist management function: click the ***Worklist*** button.

- To start Quality Assurance Procedures: click the ***QAP*** button; select the required procedure from the list presented. See the Senographe Essential *Acquisition QC Manual* for more information on starting and using the Quality Assurance Procedures.

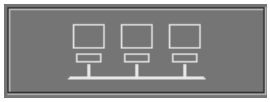
5-5 Network panel

The Network panel at the top of the Browser displays icons representing the remote DICOM-compatible hosts and local storage devices (such as CD-R) currently connected to the AWS. See section *7 Network transfer on page 135* for more information.

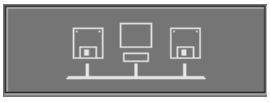
5-6 Status display

Icons and text on the Browser Status line give status information. Not all icons are present at any one time, depending on the installed options and current operations. Possible status indications are, from left to right of the screen:

- *Network status*. A dot moving along the lower line indicates that a network transfer is in progress.



- *Media transfer status*. A dot moving along the lower line indicates that a media transfer operation (e.g., to or from CD-ROM) is in progress.



- *Database query*. If present, this icon indicates that a query is in progress (local internal hard disk system access of the AWS). This icon may appear only very briefly. Any error messages that may result from a database query are also displayed in this position.

- *Filter indicator*. If present, this icon indicates that a filter is currently applied (see section *9 Filters on page 148*). Click the indicator to display the current local filter window.

- *Current date and time and Auto Delete status*. Shown in text form just below the GE logo at the right of the screen. The status of the *Auto Print*, *Auto Push*, and *Auto Delete* options is also shown (*ON* or *OFF*). *Auto Delete* is *OFF* by default. GE Healthcare recommends setting the *Auto Delete* option to *ON* when Storage Commitment from a mass archiving system is available.
- *Disk space available* is shown as the number of remaining exposures. Note that each exposure includes two images (raw and processed).

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6 Browser management

6-1 Viewing items in lists

If more items are present in a list than can be displayed at one time, use the scroll bar on the right of the list to move through the items in the list (see Chapter 7 *Control Station* for information on how to use the scroll bar).

An arrow button beneath a list indicates that more columns of information may be available; click the button to view the additional information.

6-2 Selecting and reviewing images

To work with the images stored on the AWS database (image review, network transfer, etc.):

- From the Browser screen, first select the patient, then the exam (study), and finally the desired images, by clicking on them. Each selected item is highlighted in reverse video.
  When any image is selected, all images of the series that includes the selected image are loaded and displayed.
  To select only a specific image for display, click it in the list. To add more images, click them in the list while holding down the <Control> key on the keyboard.
- Click the *Review exam* button.

The same functions that are available after image acquisition (image adjustment, measurements, annotations, etc.) are also available in review mode, with the exception of the 2D Loc. function.

6-3 Status of series

The Status column in the serie list is used for single letter flags which indicate the status of the series:

A	Archived (storage commitment received from a mass archiving system).
C	Copied onto CD-R media.
P	Sent to a printer (this does not guarantee that the image(s) have been printed).
S	Sent to a remote DICOM-compatible host.
L	Locked. Click the ***Lock*** button to lock an item.
U	Unlocked. Click the ***Unlock*** button to unlock an item.
*	In use (being reviewed, archived, or transferred). Images from in-use studies cannot be removed.

6-4 Sorting lists

To sort the items in the lists according to different criteria:

- Click the *Sort by* button above the list you want to sort, then select the desired sorting option in the drop-down menu.

  - Patient lists can be sorted by: *Identifier*, *Name*, *Last study date*.
  - Exam lists can be sorted by: *Date*, *Identifier*, *Description*, *Performing physician*, *Referring physician*.
  - Series lists can be sorted by: *Number*, *Type*, *Identifier*, *Name*, *Last study date*.
  - Image lists can be sorted by: *Number*, *Old-to-new date*, *New-to-old date*.

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6-5 Deleting images

To delete patients, examinations, series, or images from the internal disk system of the AWS, use one of the ***Delete*** buttons:

- EITHER: Select the items you want to delete in the corresponding list, then click the *Delete* button under that list (if the button is not displayed, it can be turned on using the *Tools menu*).
- OR: Drag the selected item using the middle mouse button, and drop it on the large ***Delete*** icon at the bottom right hand corner of the screen.

  - A dialog box appears prompting you to confirm the delete operation. Click *OK* to confirm, or click *Cancel* to cancel the operation.
  - If a delete button appears in grey, this indicates that the selected item is currently in use by an application (Viewer or Network transfer), and therefore cannot be deleted.
- If the mass storage option is present, an *Auto Delete* function can be set. This automatically deletes items from the local AWS database once they have been committed by the storage device. The function must be activated by your GE Healthcare Service Representative.

6-6 Interchange media

With the interchange media function you can use the *Push* button below the patient list, exam list, or image list on the ***Browser*** to save selected information on CD-R (CD-Recordable) disks.
See Chapter 24 *Interchange media*.

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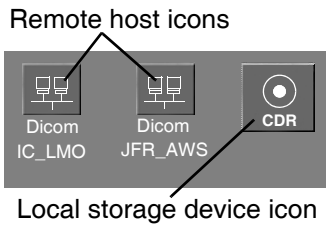
7 Network transfer

7-1 Network options

The Senographe Essential system can be provided with a networking option, allowing you to transfer acquired images to remote DICOM-compatible hosts (e.g. review workstation, Computer Aided Detection (CAD) system, or mass archiving system (PACs)). When the system is connected to a remote host, it is represented by a remote host icon in the Network panel. The name that appears below a remote host icon is determined during installation of the networking option (host label).



When the Senographe Essential is connected to a mass archiving system, acquired images can be transferred to the archiving system for permanent storage. A list of patients imaged on the Senographe Essential system is maintained on the mass archiving system, ensuring quick and easy data retrieval.

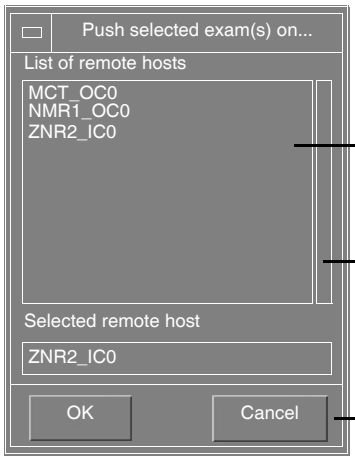
Transfers are made manually or by using the Auto Push function (selected in Medical Application preferences).

7-2 Transfer

To copy patients, studies, series, or images to another Workstation or storage device (remote host):

- Select the items you want to copy to the remote host in the patients, examinations, *series*, or *images* list.
- EITHER: Drag the selected group, using the *middle* mouse button, and drop it over the icon representing the remote host in the Network Panel,

  OR: Use the Push function; click the *Network Push* button under the list (if the button is not displayed, it can be turned on using *Browser preferences*; see section *8-2 Browser preferences on page 138*).
  The *Network Push* window appears, listing remote hosts:



Click the name of a remote host to select (highlight) it. To select several remote hosts as targets for simultaneous transfer, click them in the list while holding down the <Control> key.

If necessary, use the scroll bar to move through available remote hosts.

OK: initiate transfer
Cancel: cancel the operation

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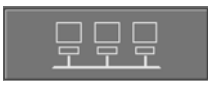
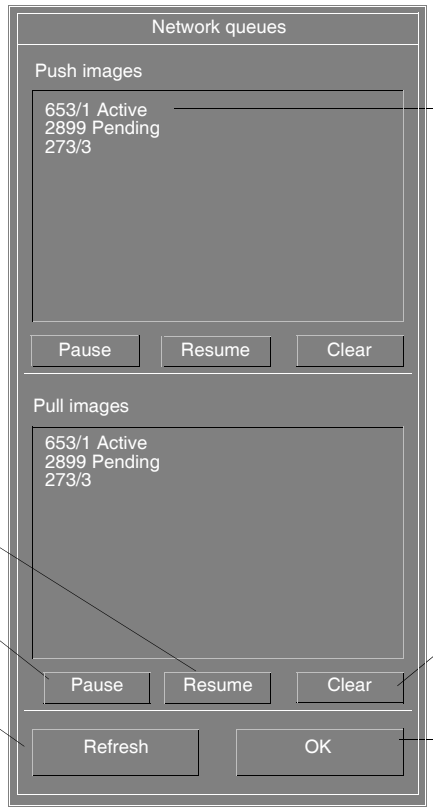
Notes:

- During a transfer, the remote host icon shows a transfer animation.
- It is possible to start or review an exam on the AWS while a transfer is in progress.
- Studies which are being reviewed, saved, or transferred are flagged as “In use”. When an item is in use, it is protected and cannot be deleted.
- When the transfer is finished, the remote host icon animation stops; the images are now available on the selected remote host.
- If the remote host cannot be reached, a dialog box reports this fact; you should verify that the remote host is operational.
  Call your network manager if the problem persists.
- If the Auto Push option is selected in Medical Application preferences:
  - With RRA disabled: Then all images in this exam will be automatically transferred to the selected remote host after exam closure.
  - With RRA enabled: Behavior is the same as above except for repeated or rejected images, which will be automatically transferred only if *Auto Push Repeated images?* or *Auto Push Rejected images?* are set to *Yes*, respectively.
- To archive exams to a mass archiving system, select the mass archiving system in the same way as any other remote host (select its icon as the drag-and-drop target, or its address as the push destination).

During a network transfer:

- To monitor network transfer tasks, click the Network status display  to open the *Network queues* window, shown below:



Job currently in progress

***Resume**:* restart a paused queue

***Pause**:* temporarily halt the queue

***Refresh**:* update the queue window (the queue window is NOT updated automatically each time a job is finished).

Click a job to select it (hold <Control> to select more than one) then click ***Clear*** to remove job(s) from the queue

***OK**:* close queue window

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8 Tools menu utilities

To access the various system utilities in the *Tools menu*:

- Click the Tools menu button (near the top right of the Browser screen) to display the utilities menu, then select the desired item from the drop-down menu:

  Filter management
  Browser preferences
  Messages
  Network management
  Worklist management
  Printer Management
  Review Room Management
  PPS Management
  Needle Setup
  Medical Application preferences
  Edit Patient/Procedure
  Set patient anonymous
  Service desktop
  Copyright Info
  Restart Browser
  Shutdown

Note:

Only select the items shown here in bold type
Do not attempt to select the other items (shown here in *italics*). They are intended for use only by your GE Healthcare Service Representative and are not described here; uninformed use may lead to unpredictable results.

8-1 Filter management

Click **Filter management** in the *Tools menu* to *Update*, *Add*, or *Remove* registered filters. See section *9 Filters on page 148*.

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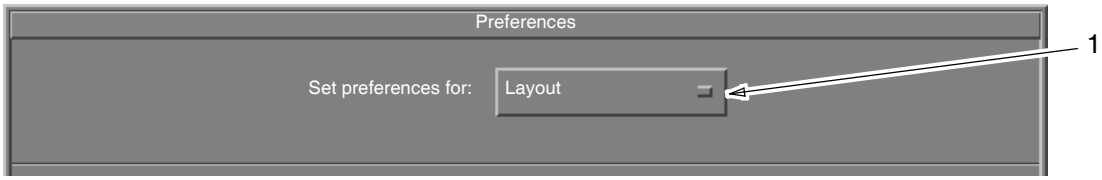
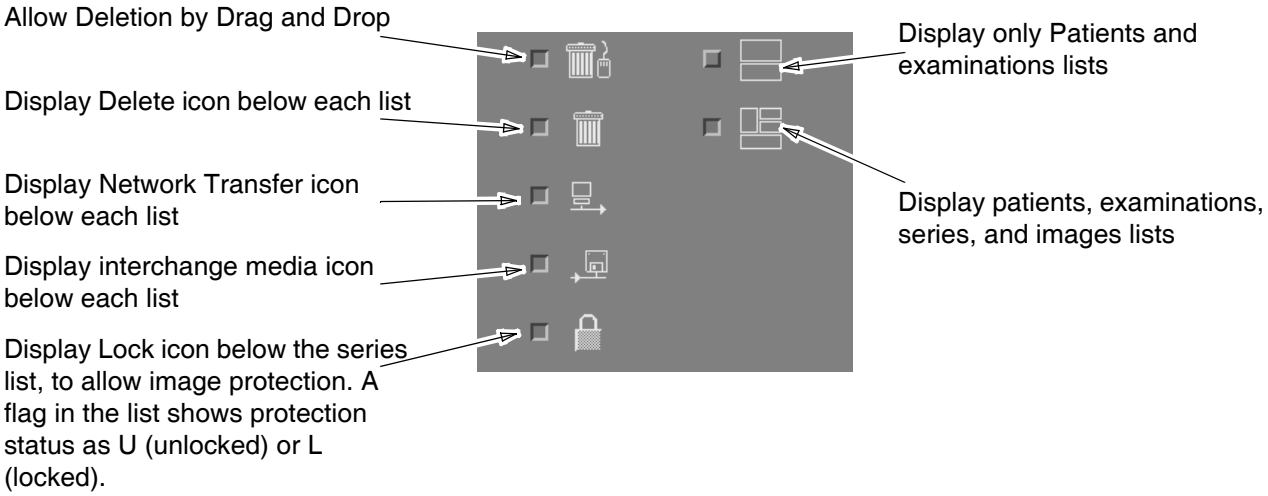
8-2 Browser preferences

Click **Browser preferences** in the Tools menu to display the *Preferences* window, which allows you to set preferences for *Layout*, *Filter*, and *Sort*.

- Click the selection box (1) to display windows for each of these choices in turn. Each window displays options which are selected by clicking to “depress” the associated buttons.



- After making selections in each window, use the five buttons at the bottom of the window to apply or save the changes:
  - **Save**. Apply the changes to the current display and save them. The displayed settings will continue to be applied until changed.
  - **Apply**. Apply the changes to the current display but do not save them. The displayed settings will be lost when you leave the Browser.
  - **Reload last saved**. After making and applying changes, use this button to apply the last saved preferences.
  - **Reset**. Apply default settings.
  - **Cancel**. Cancel your changes and close the window.
- **Layout**. This window allows selection of icons and windows to be displayed in the Browser window, as shown below:


Allow Deletion by Drag and Drop
Display Delete icon below each list
Display Network Transfer icon below each list
Display interchange media icon below each list
Display Lock icon below the series list, to allow image protection. A flag in the list shows protection status as U (unlocked) or L (locked).
Display only Patients and examinations lists
Display patients, examinations, series, and images lists

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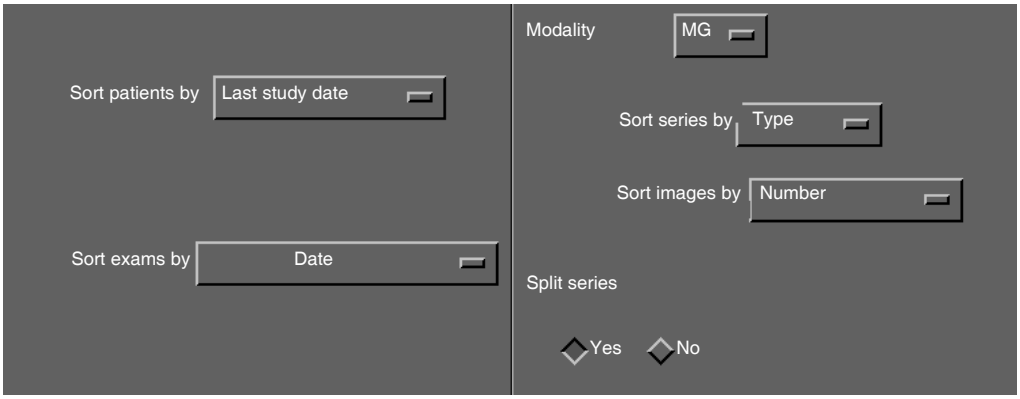
- **Filter**. This window allows you to specify whether filters (selected from a list of registered filters) should be applied to lists of items held locally (in the AWS) and/or items held remotely (e.g., in a networked remote host). To manage the list of registered filters, see section *9 Filters on page 148*.

No Filter
No Filter
Dicom
Click here to select a filter to apply to local lists of AWS
Click here to select a filter to apply to remote lists

- **Sort**. Use this window to specify an order by default for displaying lists of patients and examinations, series and images:



Note:

1. You must select **MG** for *Modality* (the system currently defaults to show DX).
2. Leave the selection of ***Split series*** as **Yes**. Other selections are not valid for this system.

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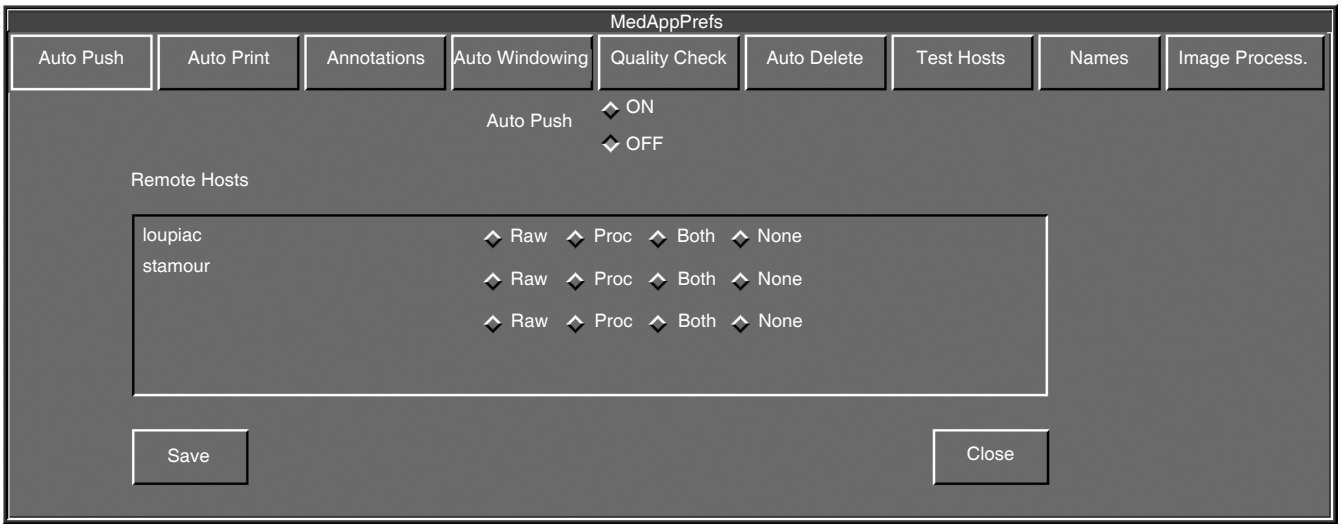
8-3 Medical Application preferences

Click **Medical Application preferences** in the *Tools menu* to set the Medical Application preferences. A *window appears similar to below.*

To change a setting, click the radio button beside the option to switch it between selected (or) and deselected (or). After making changes, click ***Save*** to apply them or ***Close*** to leave the window without saving.

8-3-1 Auto Push

Select Auto Push **ON** or **OFF**, the type of images to be transferred, and the name of the desired remote host. Remote host information is set up by the GE Healthcare Service Representative at installation time.



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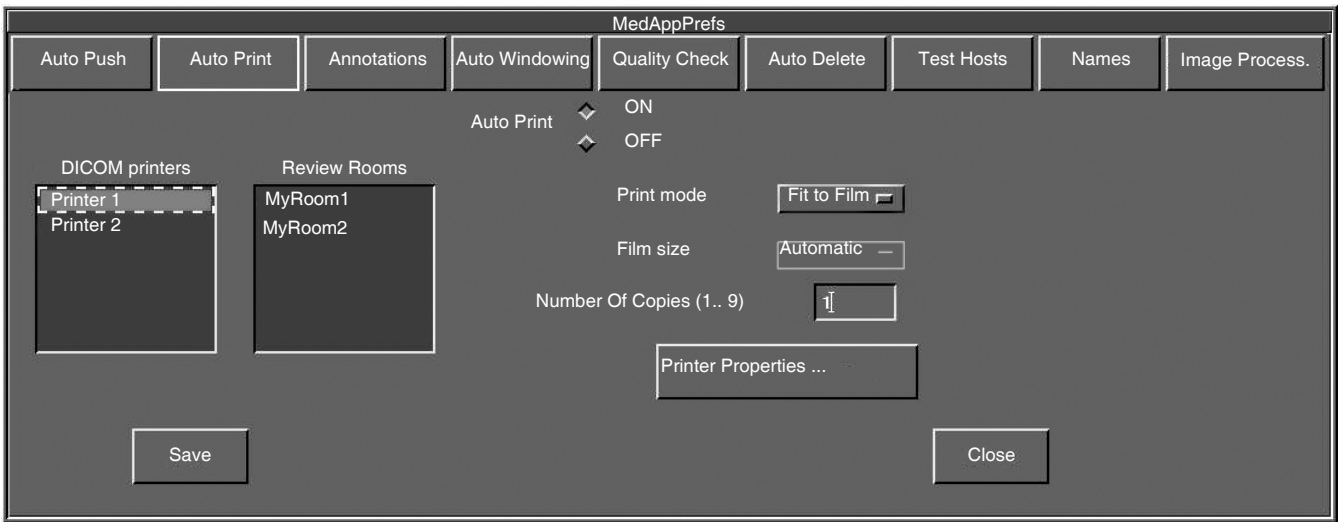
8-3-2 Auto Print

To enable Auto Print at examination closure

- Select Auto Print **ON**.
- Select the **name of the desired DICOM printer**. Information on available printers is entered by your GE Healthcare Service Representative at installation time.
- Select a **review room** if the **Review Rooms** list is not empty, depending on where the images will be reviewed.
- Only the default print mode of **Fit to Film** is available.
- Select the Film size in the scrolling list:
  - **Automatic:** film size will be automatically chosen depending on images size, i.e all 19x23 images will be auto-printed on 8x10" films, all 24x31 images will be auto-printed on 10x12" films.
  - **10x12":** all images will be auto-printed on 10x12" films, whatever their size (19x23 as well as 24x31 images).
  - **8x10":** 19x23 images will be auto-printed on 8x10" films and 24x31 will not be auto-printed. An error message will be displayed at exam closure in case the user has acquired 24x31 images to warn the user that those images cannot be printed on 8x10" films.

Note:

Do not click the ***Printer Properties ...*** button as it contains the current printer configuration. The user does not need to change any value there to set the Auto Print function. Film size value indicated in Printer Properties panel is the film size used for the last printing, which may have been an auto-print or a manual print. If Auto Print is set to ON, at exam closure, the film size value that will be considered for the Auto Print is the one of Auto Print tab. The film size value of Printer Properties panel will be erased and replaced by the film size value set in Auto Print tab.



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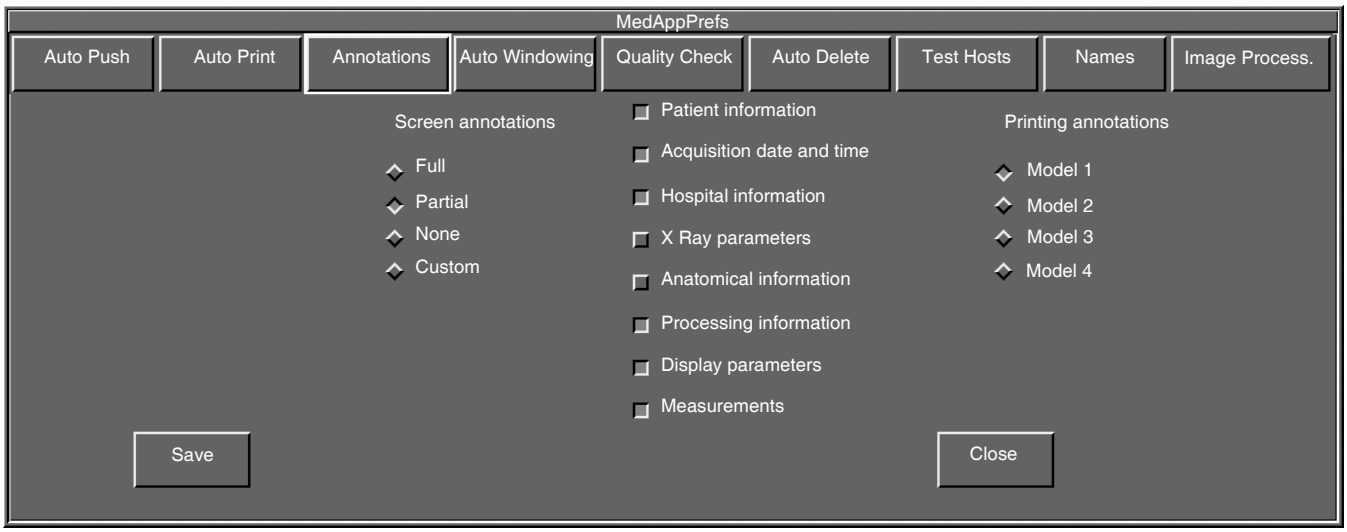
8-3-3 Annotations

Select the level of screen and print annotation desired. Screen annotation levels are chosen from **Full**, **Partial**, **None**, or **Custom**; the list of annotation types at the middle of the window shows the current default selections for the selected level. For print annotations, select the model (1, 2, 3, or 4) to be used by default (see Chapter *23 Printing*).

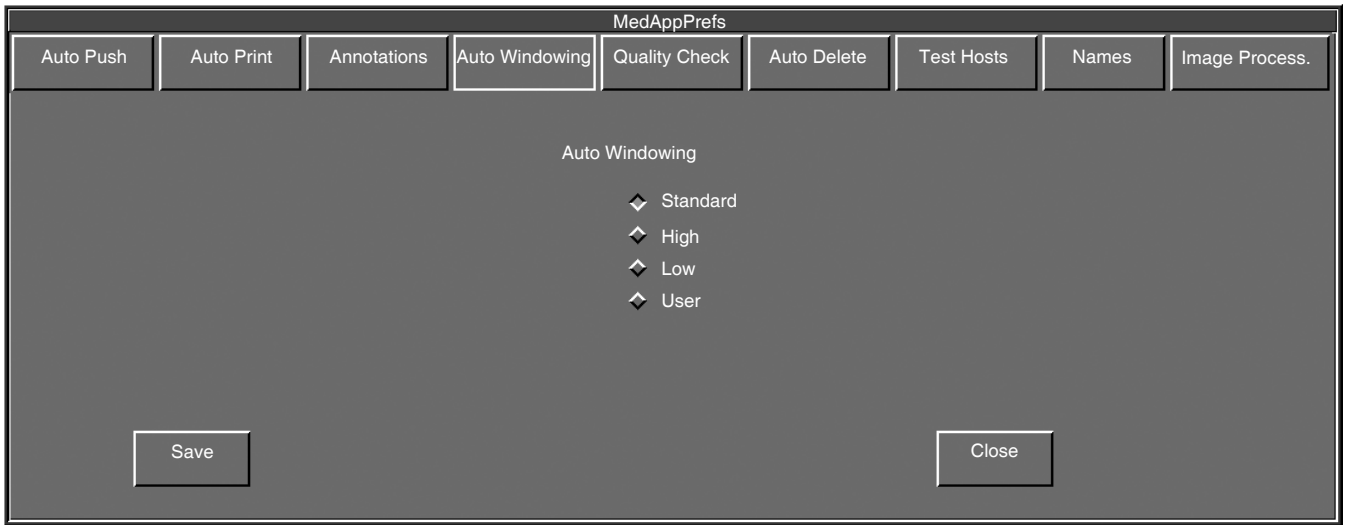
Note:

Only annotation Models 2, 3 and 4 contain all the information required by MQSA Quality Mammography Standards.



8-3-4 Auto Windowing

Images are stored with four windowing levels, **Standard** (=750), **High** *(= 600),* **Low** (=1200), and **User**. Select which level is to be used as the default when an image appears. When User is selected, the system automatically optimizes the contrast (Window Width) of the image and uses this value as the default User value if it is less than the Standard value. However, if Premium View is enabled (see *8-3-9 Image Process. on page 146*), selecting User value is considered as if Standard value was chosen. The User level can be overwritten if the Operator saves the image with modified levels.



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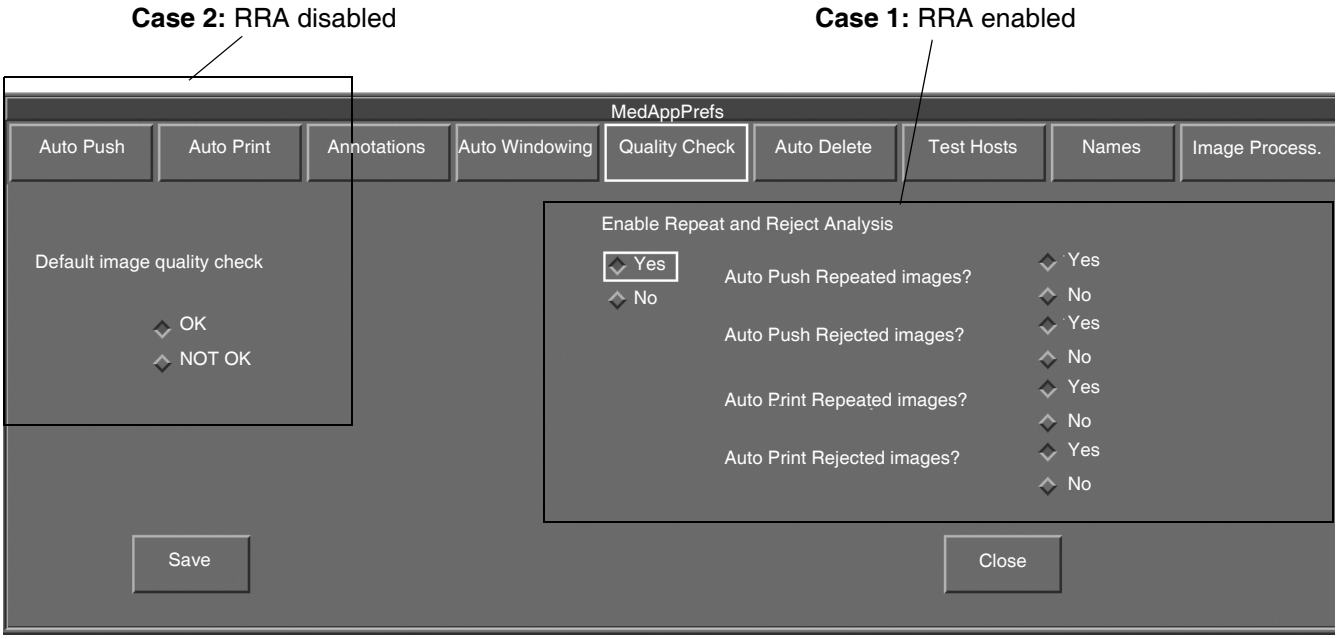
8-3-5 Quality Check

Aim of the Quality Check feature

The Quality Check feature requires the Operator to apply a qualification level to each image. This qualification level is:

- Used to trigger Auto Push and/or Auto Print,
- Used to generate image quality statistics over a given period of time (Repeat and Reject Analysis or RRA).

How to configure Quality Check



Initial decision: Do you need the RRA feature?

The RRA feature provides an alternative (and automated) method to the manual Repeat Analysis method described in the Senographe Essential QC Manual.

It is mainly intended for sites that follow MQSA regulations. For such sites, it is mandatory to perform a repeat analysis at least quarterly.

It is also useful for other sites to generate and keep statistics on:

- Total repeat and reject rates,
- The repeat reasons and reject reasons.

Case 1: RRA enabled

If you need the RRA feature, select ***Yes*** in the *Enable Repeat and Reject Analysis* section, then select the cases for which you wish to make use of the **Auto Print** and **Auto Push** features.

Note:

Once RRA is enabled, the ***Default image quality check*** is set to **OK** and cannot be modified.

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Case 2: RRA disabled

If you do not need the RRA feature, select ***No*** in the *Enable Repeat and Reject Analysis* section, then select one of the *Default image quality check* radio buttons **OK** or **NOT OK**.

This qualification level will be applied by default to all subsequently acquired images.

Next, choose the desired behavior of **Auto Print** and **Auto Push** (see *8-3-1 Auto Push on page 140*).

Note:

When RRA is disabled, the **Auto Push** and **Auto Print** settings in the Quality Check window are grayed out and cannot be configured.

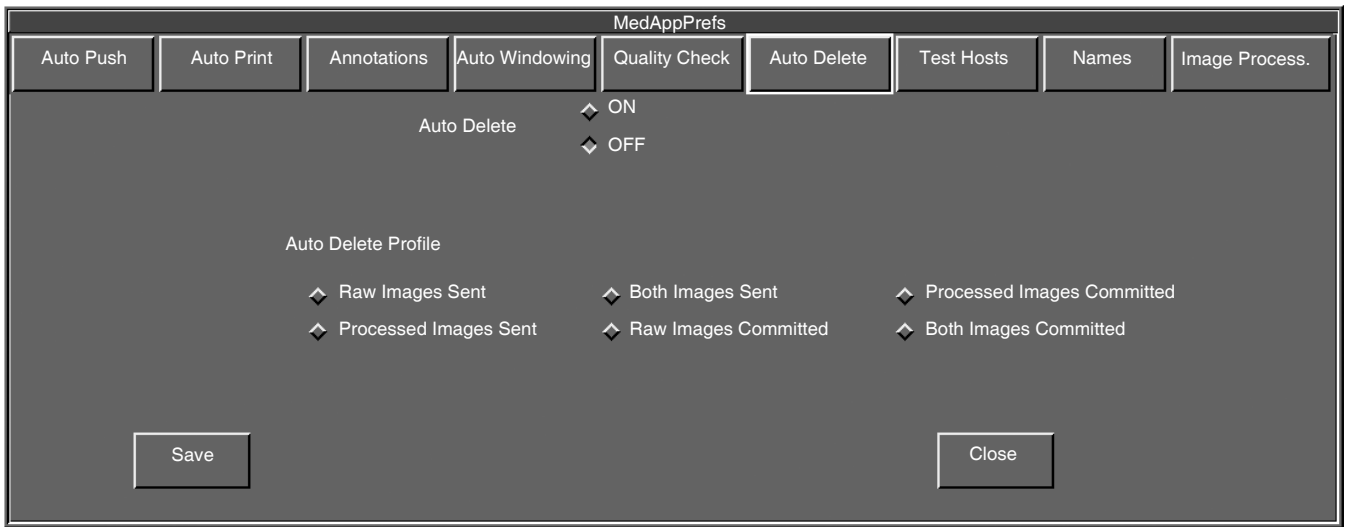
8-3-6 Auto Delete

Select the appropriate **Auto Delete** radio button, corresponding to whether or not you want the Auto Delete function to be enabled. If you enabled the Auto Delete function, then specify the profile of images to be automatically deleted. Raw and/or processed images can be automatically removed from the AWS internal disk system when they have been transferred (sent) to another Workstation, or committed by a mass archiver.

Note:

When the function is turned on, at least one of the profile buttons must be selected; if the disk system's used capacity reaches the Upper Threshold value*, the oldest exams are deleted by the system to make space for new ones, until the disk space reaches the Lower Threshold value*. Images which have been on the disk for less than the Miminum Storage time* are not deleted.

* Values for Upper Threshold, Lower Threshold and Minimium Storage time have been adjusted by your Field Engineer at system installation, according to the workflow information you provided to him. Call you Field Engineer in case you want to modify those settings.



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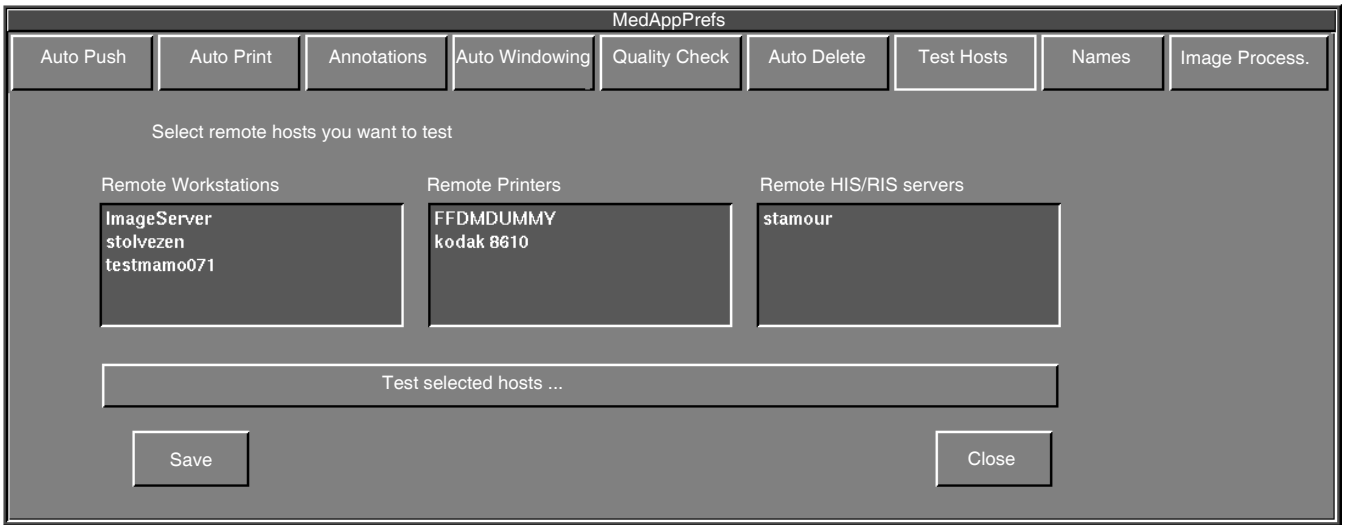
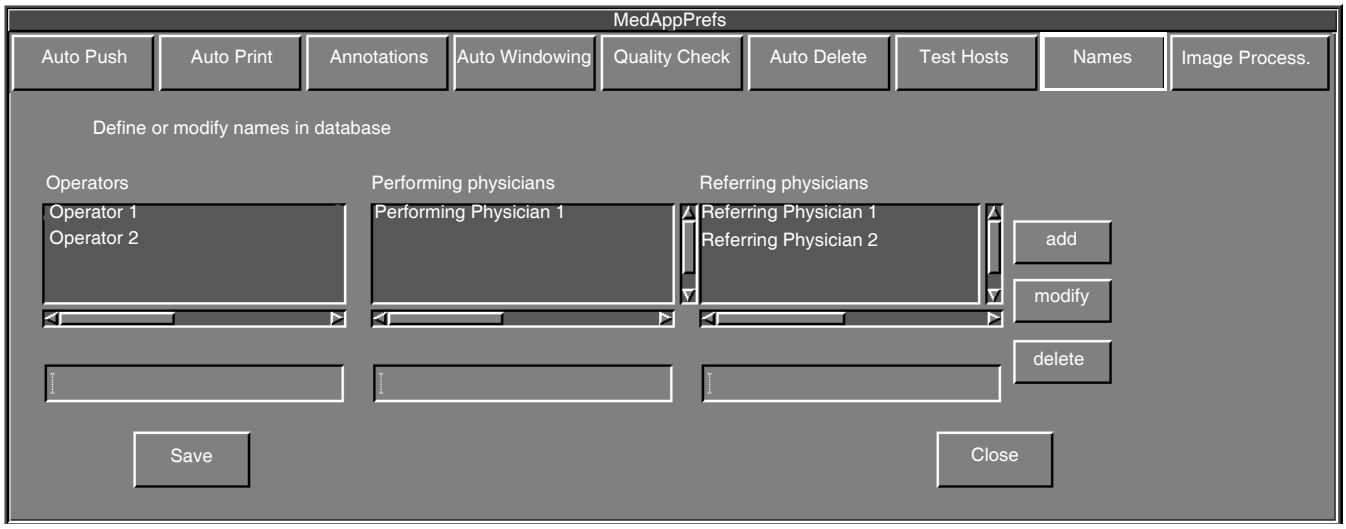
8-3-7 Test Hosts

Use this screen to test remote host connections. Select the host(s) to be tested in the three sections (**Remote Workstations**, **Remote Printers**, and **Remote HIS/RIS servers**), and click the ***Test selected hosts ...*** button to start the test. A message appears to indicate whether the test was successful or the host could not be reached.



8-3-8 Names

Use this screen to enter and store the names of **Operators**, **Performing physicians**, and **Referring physicians**. The stored names may then be recalled from the AWS database when required, avoiding the need for retyping each time a *Medical Procedure Card* is created or updated.



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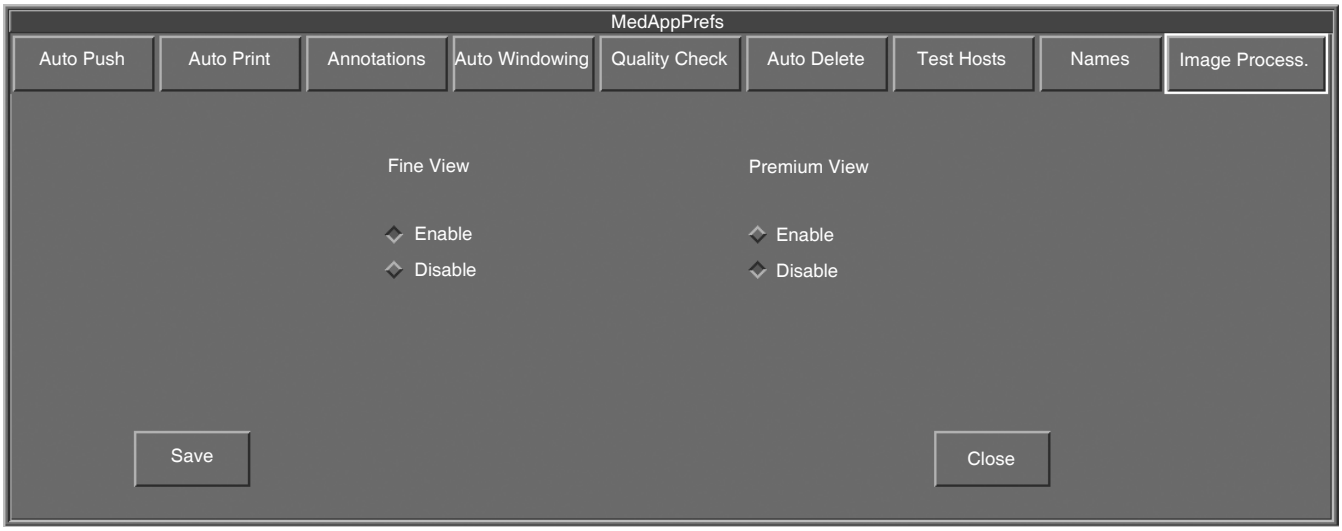
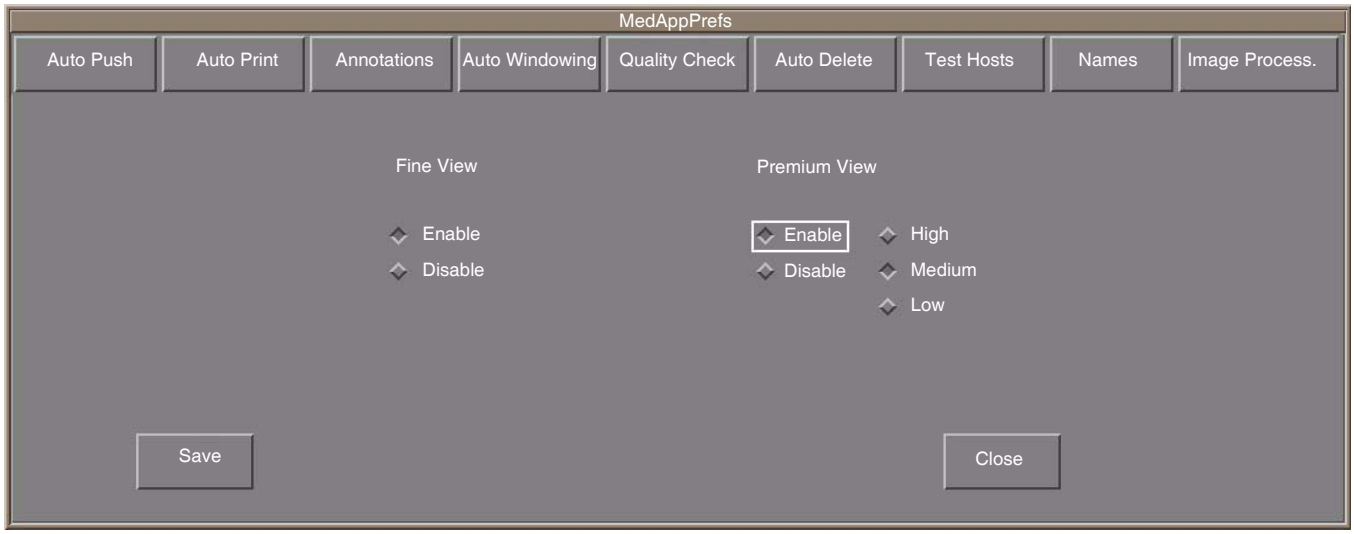
8-3-9 Image Process.

Use this screen to enable or disable **Fine View** and/or **Premium View**, as well as to select the strength for local contrast enhancement in Premium View if this feature is enabled on your equipment.

If the Premium View strength selection is not **Enable** on your equipment, the following screen is displayed:



If the Premium View strength selection is enabled on your equipment, the following screen is displayed :



- When Fine View is set to Enable, it is applied to all RAW images generated by the Medical Application. Fine View shall always be enabled except for Quality Control purposes. See section *1 Raw image on page 191* in Chapter *22 Image processing and display*, for more information on using Fine View.

Note:

Fine View shall always be enabled for clinical examinations.

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- If Premium View is set to Enable, it is applied to all eligible processed images generated by the Medical Application. See section *2 Processing on page 191* in Chapter *22 Image processing and display*, for more information on using Premium View.

  If the Premium View strength selection is enabled, default strength will be *Medium*. This value corresponds to the Premium View strength used when the feature is not activated.

  Two more strength settings are available, to provide alternative balance between local contrast and global contrast:
  - *High* setting should be used to get a higher local contrast
  - *Low* setting should be used to get a lower local contrast
- If Premium View is set to **Disable**, Thickness Equalization will be applied to all eligible processed images generated by the Medical Application. In that case, it is not possible to choose the strength for local contrast enhancement in PremiumView. See section *2 Processing on page 191* in Chapter *22 Image processing and display*, for more information on Thickness Equalization.

8-4 Edit Patient/Procedure

This option is normally turned off, but may be turned on by a GE Healthcare Service Representative if required. It allows information on the patient *Medical Procedure Card* (described in Chapter 19 *Worklist*) to be viewed and modified after the exam has been closed. Changes are made by creating a new patient or a new examination; the original file is always kept for security reasons.

Any changes made to the *Patient* identity information cause a new patient file to be created, with copies of the existing exams. Fields which can be changed are: name, ID, date of birth, and sex. No change can be made to fields such as *Operator*, *Referring Physician*, or *Performing Physician*. When changes are made and a save is requested, a confirmation message appears. If the save is confirmed, a message appears as a warning that a new entry will be made in the AWS database, and suggests that the old information should be manually removed. Note that if the old records are not deleted, repeated use of this facility can rapidly use up space in the AWS disk system.

8-5 Set patient anonymous

This option allows an anonymous set of images to be created, for discussion with colleagues, etc. Select one or more patients in the *Patient name* list, then click the **Set patient anonymous** option in the *Tools* menu. The patient examinations are copied and used to create a new patient with the name NO NAME and a unique randomly created ID.

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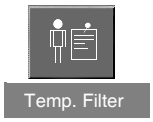
9 Filters

Filters allows the lists of patients and exams shown in the Browser to be “filtered”; in other words, to display only items which correspond to your chosen criteria (for example, between chosen dates, with certain Patient name or IDs, etc.).

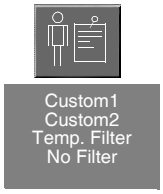
Filters can be temporary, in which case they will be lost after the current session, or can be “registered” as a named filter which can then be recalled for later use.

9-1 Selecting a registered filter or creating a temporary filter

The legend under the button in the Filter Panel at the top of the Browser shows the current selection for the Browser Filter, e.g., Temp. Filter.



To change the current selection, click the ***Filter*** button in the Filter Panel and make your selection from the drop-down menu:



Custom...	Use registered filters that have been defined and saved beforehand (Custom1 and Custom2 in this example),
Temp. Filter	Use a temporary filter,
No Filter	Display all available patients, Examinations, Series, and images.

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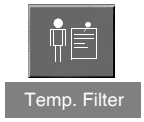
9-2 Temporary filters

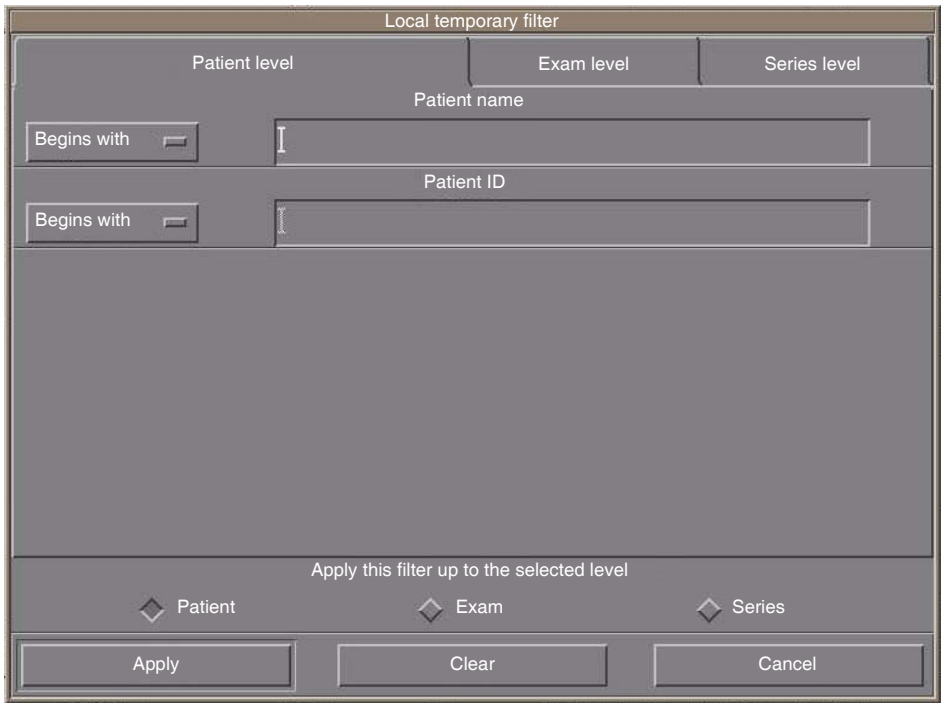
For occasional queries, use a temporary filter. The filter is used only for the current Browser session and is not saved.

Click the ***Filter*** button and select ***Temp. Filter*** in the drop-down menu.



The Local temporary filter window appears in which you can specify the filter characteristics:

- Filters can be specified at *Patient level*, *Exam level*, and *Series level*. By default, *Patient level* is selected first, but you can select these levels in any order; click the appropriate tab at the top of the window to start specifying filter criteria:



  - *Patient level*: you can choose to begin the listing with a specified Patient name or Patient ID.
  - *Exam level*: you can choose to begin the listing with a specified *Exam description*, *Performing physician* or *Referring physician* name, or to list only exams made between certain dates and/or times. Do not change the default selection of mammography exams (MG), since the AWS cannot display images from other modalities.
  - *Series level*: you can choose to list only exams with a specified text in the *Series description*, and to list only Secondary Capture (SCPT), Raw, or Processed exams.
- When you have made your selections in each level, click one or more of the boxes at the bottom of the screen (Patient, Exam or Series) to specify at which level the filter is to apply.

  Each choice made at patient, exam, or series level allows you to select how the specified text is to be used to select listed items:
  - "Begins with". Items are displayed if they begin with the specified letter or word(s).
  - "Contains". Items are displayed if their description contains the specified text.
  - "Is". Items are displayed only if their description exactly matches the specified text.
- At any time you can click the *Clear* button to delete the choices made and start again, or the *Cancel* button to return to the previous screen.

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- When your selections are correct, click *Apply*.
  The filter is applied, but is lost when the current session ends.

9-3 Registered filters; Filter management

For repeated queries, use custom filters. A custom filter is defined and saved (registered) separately. Once defined and saved, the name of the custom filter is added to the Filter menu. It can then be used at any time, clicking the *Filter* button and selecting it from the drop-down menu.

- To create, update or remove a custom filter, select Filter management in the *Tools menu*:
  The *Filter selection* window appears, giving a list of registered filters and a list of options:

Update	Modify a registered filter (selected from the list)
Add	Create a new registered filter
Remove	Remove a registered filter
OK	Return to the previous screen

- The default choice is Add. If you select Add or Update, the *Local filter* window appears, in which you can specify the new or modified filter characteristics.
  This window is identical to that used for a temporary filter, except that you must specify a name to identify the filter. On completion, you are asked to *Save* the new or modified filter.
- To apply the filter, return to the Browser and select the filter using the *Filter* icon.
- To apply the filter in a Remote Host Browser, open the Remote Host Browser of interest and select the filter using the *Filter* icon. If the desired filter has just been added or updated, first restart the Browser for the changes to take effect in Remote Host Browsers (see section *2 Browser restart on page 130*).

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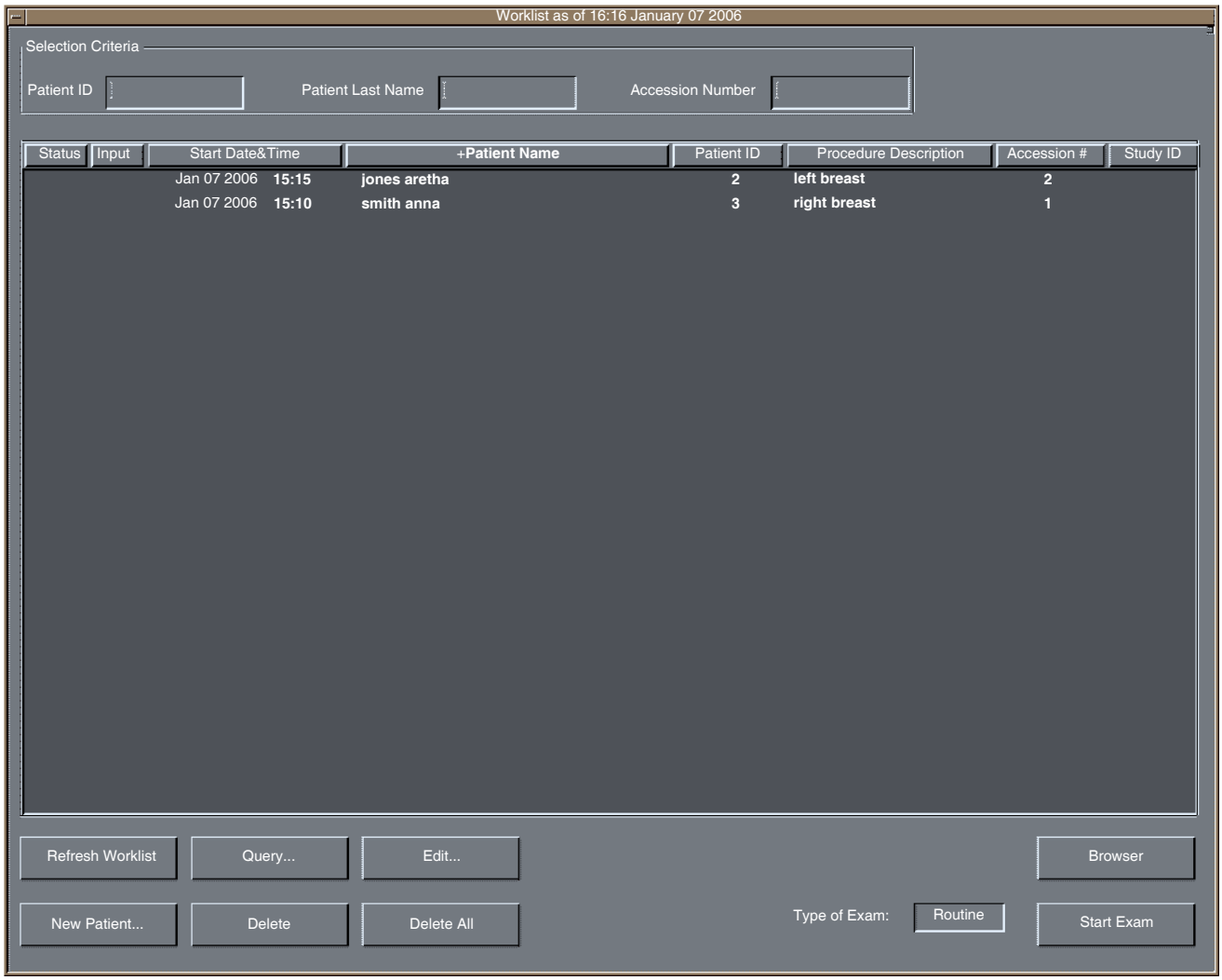
Chapter 19 Worklist

1 Worklist function

The Worklist is a list of scheduled tasks. Typically, it shows all patients scheduled for examination during a working day.

When the Senographe Essential system is connected to a DICOM Worklist Management Service Class Provider (SCP) system, entering the Worklist function displays a Worklist downloaded from the SCP system, using the DICOM Basic Worklist Management Service. Downloading information in this way reduces the Operator's workload, increasing throughput and decreasing the risk of errors. However, Worklist entries can also be made locally, from the AWS.

Click the ***Worklist*** icon at the right of the *Browser* to display the *Worklist* window as shown below. To start an exam, select the required patient in the list. Selections can be made by clicking with the left mouse button, or by entering appropriate text in one of the three *Selection Criteria* text boxes above the list: *Patient ID*, *Patient Last Name*, or *Accession Number*. When the correct patient has been selected, click the ***Start Exam*** button or double-click your selection to continue with Image Acquisition. See below for more information.



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- The *Worklist* title bar shows the date and time of the last update (manual or from HIS/RIS).
- Click the *Browser* button to return to the *Browser*.
- By default, when the *Worklist* window opens, it is sorted by *Patient Name*, the first item in the list in which the number of images is zero is selected, the cursor is in the first selection criteria entry field, and the default push-button is *Start Exam*.
- The Worklist information appears in columns. You can sort the entries according to the information in any column, in ascending or descending order, by clicking the title at the head of the column. For example, to sort on patient name, click the Patient Name column header. The entries are automatically displayed in ascending order of name, and a + sign appears in front of the title (*+Patient Name*). Click the column header again; a - sign appears in front of the title (*-Patient Name*), and the entries are now displayed in descending order of name.
- Items in the Worklist are selected/deselected by pointing and clicking. Non-consecutive multiple items are selected by holding down the <Control> key while clicking. To select a range of consecutive multiple items, select an item, then hold down the <Shift> key while clicking another; both items and all in between are selected.
- To find and select an item in the list, use the *Selection Criteria* at the top of the window. As soon as a character entry is made in one of the boxes (*Patient ID*, *Patient Last Name*, *Accession Number*), the window scrolls to show and select the first matching entry. When an entry is made in one of the criteria boxes, the other two are automatically cleared.
- Click the *Refresh Worklist* button to download the current Worklist from the configured DICOM Worklist Provider. If the DICOM Worklist feature is not installed, or the Provider is not configured, this button is greyed out and not active.
  While the list is being updated, an indicator *WORKLIST LOAD IN PROGRESS...* appears, the ***Refresh Worklist*** button becomes ***Cancel Load***, and all buttons except ***Cancel Load*** and ***Browser*** are disabled.
- Click *Query...* to display the *Query definition* window, to define the networked Worklist parameters.
- To delete selected patients from the Worklist, click the *Delete* button. To delete all patients, click the *Delete All* button. User confirmation is requested before deletion. Note that this deletion has no effect on patient data stored on a DICOM Worklist Provider.
- Click *New Patient...* to display an empty Medical Procedure Card window, allowing a new patient to be added to the list.
- Click the *Edit...* button (only active if a single item is selected) to display the Medical Procedure Card window with data for the selected item, allowing you to view and/or add information.
- If the Stereotaxy option is present, select *Routine* or *Stereo* in the *Type of Exam* window.
- With the correct patient selected in the Worklist, click *Start Exam* or double-click your selection to display the Viewer window and allow image acquisition for the scheduled patient.

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2 Image acquisition

2-1 Medical Procedure Card

The *Medical Procedure Card* (MPC) is used to enter all patient-, procedure- and Operator-related data. This data is saved together with the exam images.

Note:

Patient Last Name and Patient ID are mandatory: you cannot start an exam if these fields are not completed. The remaining information on the card is optional.

There are three ways to enter the data:

- Manually.

  Enter the information directly into each of the MPC fields.
- Using a bar code scanner (optional on Senographe Essential).

  If your facility produces bar code labels to identify patients and their scheduled exams, all the data stored on the bar codes can be scanned with the bar code scanner option. Scanning produces an MPC for each patient scanned, saving time and reducing errors as compared with an exclusively manual data entry process.
- Through a DICOM HIS/RIS/MIS system.

  In this case the Worklist receives directly from the HIS/RIS/MIS the patient and/or procedure information needed to fill in the MPC.

  Patient information and some procedure information (accession number and Study ID) received in this way cannot be modified.

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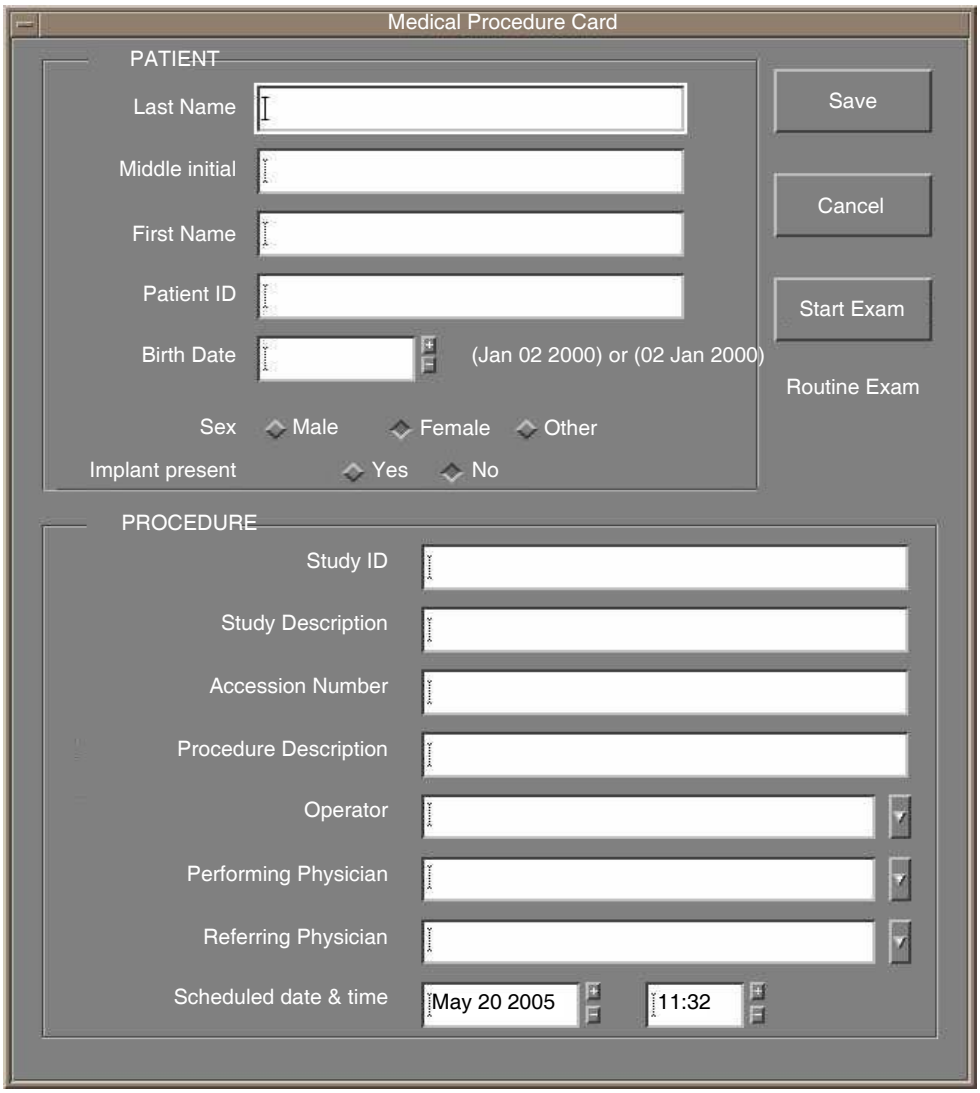
When you select a single patient in the Worklist and click ***Edit...***, or when you click ***New Patient...*** or ***Start Exam***, the *Medical Procedure Card* window appears. See next ilustration:



- For a new patient, all fields are blank; move the cursor (use the mouse, or use the Tab or Enter keys to move through the fields) inside the *Last Name*, *Middle initial* (optional) and *First Name* fields and enter the patient name. Then move the cursor inside the *Patient ID* field and enter the patient ID.
  If the patient has an implant (in whatever breast), tick "Yes" after "Implant present" label. In case the review station used at your facility can read this field, it will automatically load an adequate protocol and/or adapt the autowindowing for review of images of this patient.
- For a new examination (existing patient) the patient information fields cannot be modified.
  Complete the other fields as required, then click the *Start Exam* button. The *Medical Procedure Card* window closes, and the Viewer appears.
- For a patient selected on the HIS/RIS Worklist, verify that the information in all fields of the Medical Procedure Card is correct and click *Start Exam* to begin the exam, or *Cancel*.

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- After the first acquisition has been made, the information in the Medical Procedure Card cannot be changed. However, errors can be corrected by creating duplicate information using the Edit Patient option in the *Tools menu* (described in Chapter 18 *Browser*). The original information is saved for security.

2-2 Image Acquisition - New Patient...

To start an exam for a new patient:

- Click the *New Patient...* button.
  The *Medical Procedure Card* window appears.

  Note:
  A patient must have unique identifiers (name and ID mandatory, first name optional).
- When the card entries are complete, click *Save* to add the patient to the Worklist for future use, *Start Exam* to begin the exam, or *Cancel* to exit.

  If *Start Exam* is selected, the Viewer opens with the *Medical Procedure Card* displayed.

  Check the information displayed. If it is not correct, do not proceed; select *Cancel* and confirm to close the Viewer. On returning to the Worklist, select the correct patient and select ***Edit...***. Make any changes required, then click *Start Exam* to again open the Viewer with the *Medical Procedure Card* displayed. If the information is now correct, begin the first acquisition.

2-2-1 Patient Birth Date

To enter the Birth Date in the *Medical Procedure Card*, type the month (first three letters), space, the day (two digits), space, and the year (four digits), i.e.: MMM DD YYYY. The first three letters of the month must be typed in English, regardless of the language of the system. The following table gives the English abbreviations of month names:

Month	English Abbreviation
January	Jan
February	Feb
March	Mar
April	Apr
May	May
June	Jun
July	Jul
August	Aug
September	Sep
October	Oct
November	Nov
December	Dec

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2-3 Edit Patient

To edit patient information (only possible before making the first acquisition for the patient):

- Select the patient in the list and click the *Edit...* button.
  The Medical Procedure Card window appears.
  This function is not available for information received from an HIS/RIS Worklist.
- When the changes to card entries are complete, click *Save* button or *Start Exam* button.

2-4 Image Acquisition - New examination

To add an exam for an existing patient:

- Select the patient name in the patient list on the Worklist by clicking on it.
- Click the *Start Exam* button.

The remaining procedure is the same as for a new patient, except that the patient and procedure information fields (other than Operator and physician) in the Medical Procedure Card are already complete and cannot be modified (displayed in grey).

2-5 Image review

To review images stored on the AWS disk system, return to the Browser screen: see section *6-2 Selecting and reviewing images on page 133* of Chapter 18 *Browser*.

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3 Bar code scanner option

The Senographe Essential bar code scanner is a fast and accurate optional tool for scanning bar code symbols in AWS applications. It is normally mounted on the side of the AWS Cabinet.

The scanner captures entire bar code symbols instantly. The integrated decoder then transmits the data to the AWS just as if data were entered from the AWS keyboard.

Supported bar code symbol systems are:

- Code 3 of 9 (standard & full-ASCII).
- EAN 13.
- Code 128.

Two models of the bar code scanner exist, as follows:

- 3800LX-14 - has a coiled USB cable
- 3800G - has an uncoiled (straight) USB cable

The model number (3800LX-14 or 3800G) is located underneath the head of the bar code scanner.

3-1 How to read a bar code symbol

The Senographe Essential bar code scanner is simple to use - just aim and press the scanner trigger. Before using it, make sure all cable connections are secure.

1. Lift the scanner from its support; Hold it naturally in one hand, with your finger on the scanner trigger. Hold the scanner handle horizontally, with the beam window directly over the sample bar code symbol (code 128) shown here:

2. Press the scanner trigger: the scanner red LED beam lights. The scanner has successfully read the symbol if:
   - You hear a beep.
   - The LED beam turns off.

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3-2 Set default configuration

The scanner should already be configured for use with the AWS. If not, configuring the scanner to the default configuration is easy. You simply scan bar code menus.

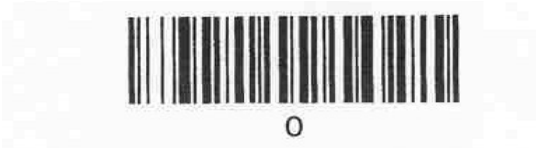
- Follow the steps below to reset the scanner to the AWS configuration. At each step, read the bar code provided, using the scanner as described above (section *3-1 How to read a bar code symbol on page 157*). You should hear one or more beeps after each scan.

3-2-1 3800LX-14 Bar Code Scanner Settings

1. Reset the bar code scanner to factory settings.

2. Set the default language.

3. Set the default language to English. The scanner must always be set to English for use with the AWS



4. Save the new settings.

- Refer to the scanner documentation for more information on using the scanner.

3-2-2 3800G Bar Code Scanner Settings

1. Reset the bar code scanner to factory settings.

2. Set the scanner to full ASCII Code 39 on mode

- Refer to the scanner documentation for more information on using the scanner.

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3-3 Using the scanner for AWS text entry

To enter text in AWS data entry fields using the bar code scanner:

1. Set the cursor in the desired data entry field in the usual way, as if you were about to use the keyboard for text entry.
2. Scan the appropriate bar code symbol as described in section *3-1 How to read a bar code symbol on page 157*. The decoded text appears in the text field just as if you typed it using the keyboard.

3-4 What If...?

- Nothing happens when you follow the operating instructions:
  - Check the system power.
  - Check for loose cable connections.
- The AWS goes back to monitor *OK* prompt:
  - Resetting or disconnecting/reconnecting the bar code scanner may cause the AWS to return to the monitor *OK* prompt. In this case:

    Type the command **go <Enter>** to return to the normal working mode.
- The scanner does not read a bar code symbol:
  - Be sure the scanning system is programmed to read the type of bar code you are trying to scan. See section *3-2 Set default configuration on page 158*.
  - Be sure the bar code symbol is not defaced.
  - Be sure that you are holding the scanner correctly to scan the symbol, as illustrated below. The scan head must touch and cover every bar and space on the symbol. You can tilt the scanner forward or backward. Practice will quickly show you how to hold the scanner.

Right

Wrong

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Chapter 20 Modality Performed Procedure Step (PPS)

1 Overview

The Modality Performed Procedure Step (PPS) function is an automated function that allows the Senographe Essential acquisition system to automatically inform a remote network host (typically located on the Radiology Information System (RIS) or the Picture Archiving and Communications System (PACS)) of the Radiology department about the completion status of the locally performed examinations. Typically, it enables the Senographe Essential to automatically inform the other connected devices such as the PACS, the Computer Aided Detection (CAD) system and the RIS whether a given scheduled or unscheduled exam is in progress, completed or on hold.

The activation of this function within a Radiology Department is subject to the following pre-requisites:

- An image archiving system (PACS) must be accessible for Auto Push of the acquired images via the DICOM protocol.
- A DICOM Performed Procedure Step Service Class Provider (PPS SCP) must be connected to the Senographe Essential. In general, such a DICOM service is available from either the RIS or the PACS.
- It is strongly recommended that the Senographe Essential also be connected to a DICOM Worklist Management SCP for automated Worklist retrieval. For additional information on the Worklist function on the Senographe Essential, see Chapter 19 *Worklist*.

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2 Operation

Once activated, the PPS function performs background tasks to exchange information with the configured PPS SCP. This function is activated for both routine and stereotactic (if the option is present) examinations.

When the Viewer is started and after the first image has been acquired, an initial PPS message is sent from the AWS to the PPS SCP to inform it that the examination is now in progress. This message also contains the patient and clinical data stored in the Worklist entry used to launch the Viewer. These data can either have been downloaded from a Worklist server or entered manually on the AWS itself.

When the Viewer is closed, a second PPS message is sent to the PPS SCP to update the examination data with the following information:

- A Operator-selected exit status (see section *4 PPS in the Viewer on page 163*).
- A list of the images that will be automatically sent, via the Auto Push feature, to the associated Image Archiver or CAD.

Note:

In order for the PPS messages to be sent, the Auto Push feature from AWS to the associated Image Archiver or CAD must be activated.

Note:

In case some images have been excluded from the Auto Push list (e.g. using the Quality Check feature) those images will not be listed in the PPS messages sent to the PPS SCP.

- The cumulative AGD (Average Glandular Dose) calculated based on the AGD estimation available for images acquired in AOP. This dose per examination estimation is computed using the following rules:
  - Images that have been acquired and excluded from the Auto Push list (e.g. using the Quality Check feature) are accounted for in the overall dose value.
  - Images acquired in manual mode are not accounted for, as no dose estimation is available for them.

3 PPS configuration

PPS configuration is accessed by clicking the *Tools menu* button and selecting **PPS Management** as shown in section *8 Tools menu utilities on page 137* of Chapter 18 *Browser*.

Note:

The *PPS Management* panel is not intended for use by Operators of the Senographe Essential, and therefore is not described here. Refer to your GE Healthcare Service Representative (or possibly your local network administrator) for assistance on setting up PPS hosts, as unassisted use may lead to unpredictable results.

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4 PPS in the Viewer

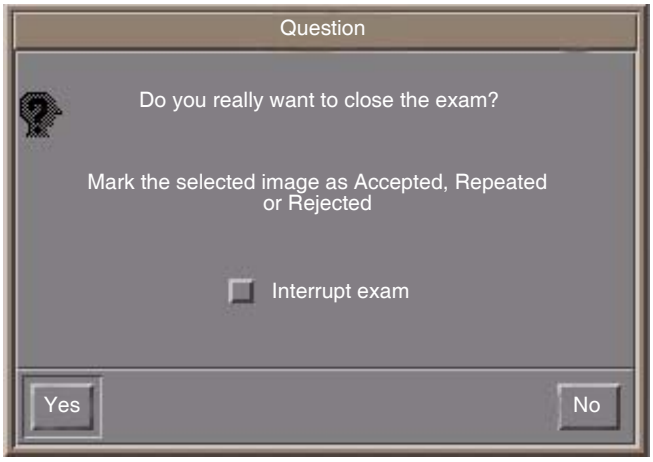
To be able to optimize post acquisition tasks, the Senographe Essential sends a completion status message to the PPS SCP when the exam is started and when it is closed.

When a routine or stereotactic examination is started, and the first image has been acquired, the Senographe automatically sends an *IN PROGRESS* status to the PPS SCP.

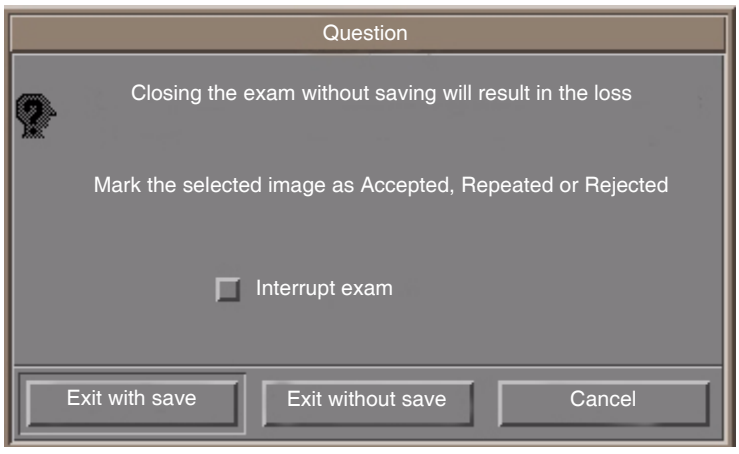
When the Operator closes this Viewer session, one of two possible completion status messages is sent to the PPS SCP:

- *COMPLETED*: The procedure described in the Worklist entry used to perform the acquisitions of this Viewer session has been completed. No further images are to be acquired for this procedure.
- *DISCONTINUED*: The procedure described in the Worklist entry used to perform the acquisitions of this Viewer session is not completed. Most likely further images will be acquired for this procedure to be completed.

By default, all closed examinations are defaulted to sending the *COMPLETED* status to the remote PPS SCP. In order to switch the status to *DISCONTINUED*, select the **Interrupt exam** check box that appears in the *Question* dialog box of the Viewer:



OR


Question
Closing the exam without saving will result in the loss
Mark the selected image as Accepted, Repeated or Rejected
Interrupt exam
Exit with save
Exit without save
Cancel

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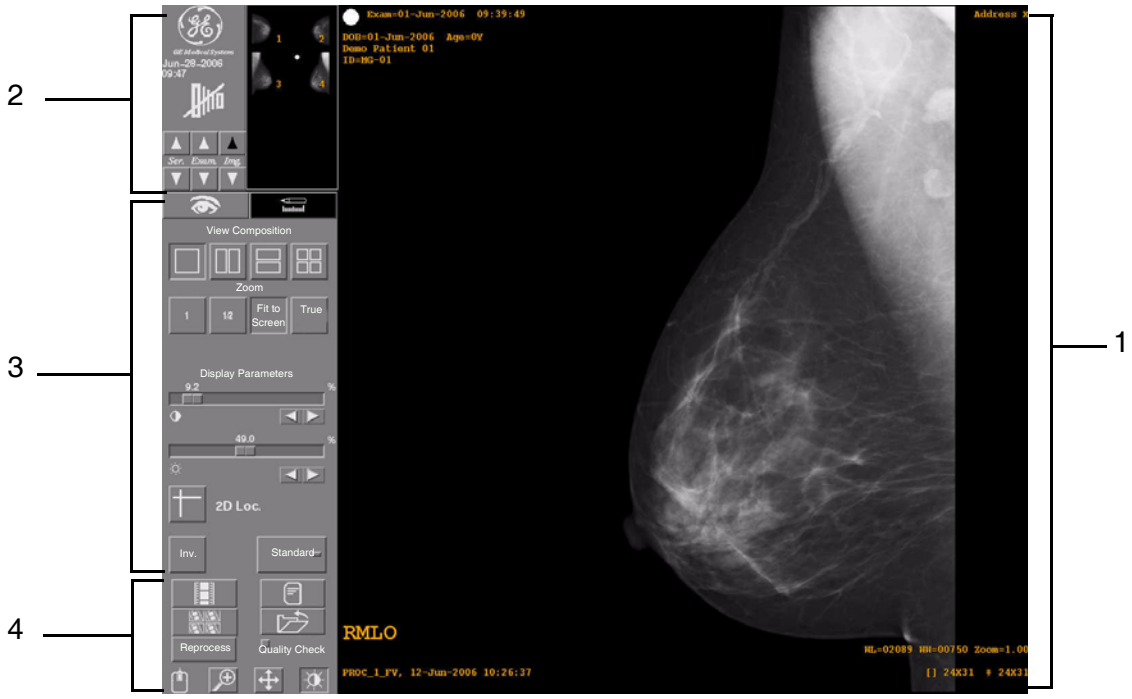
Chapter 21 Viewer

1 Overview

The Viewer window appears when:

- the *Review exam* button in the Browser window is clicked after selection of a Patient, examination, or series. The Viewer window opens and displays the first acquired image.
- the *Start Exam* button in the Worklist window is clicked after selection of a Patient in the Worklist. The Viewer window opens, with the Medical Procedure Card displayed, ready to display the acquired image.

The Viewer window allows you to display, manipulate, and analyze images that have either been acquired using the Digital Detector or recalled from the disk system for review:



- Most of the screen is used for the *Viewing Area* (1), in which images are displayed.
- At the left of the screen, there is a Command window, which includes three main sections:
  - The Mosaic Image Browser (2).
  - The Control Panel (3).
    Two selection buttons at the top of the panel allow one of two different Control Panels (*View Control* and *Annotation*) to be displayed, according to the functions required. A third selection is possible if the Stereotaxy option is present. Functions available from the two panels are described in sections *2 View Control on page 169* and *3 Annotation on page 172*.
  - Function panel (4). Provides access to the Medical Procedure Card, image reprocessing, image printing, scrapbook, image quality check, Middle mouse button function selection, and exit from the Viewer. See section *4 Function panel on page 181* for more details.
- To leave the Viewer, click the ***Close Exam*** button in the Function panel. All changes to annotations are saved. They are saved locally but are not transmitted to the Seno Advantage or PACs. If changes have been made to brightness or contrast settings, you are asked to *Exit with save*, *Exit without save*, or *Cancel* .

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1-1 Viewing area

You can choose to have one, two or four images displayed in the viewing area. See section *2 View Control on page 169* on how to select the desired layout.

To make it easier to view the images in the viewing area, you can place a "shutter" (mask) over the command window.

- Pressing the <F10> function key (in the top row on the keyboard) allows you to toggle between masking and unmasking the command window.

1-1-1 FB view exception

On the AWS, the View and Laterality indication is placed in the lower part of the monitor.

Most images of the breast are presented with the axillary region in the upper part of the monitor.

The FB (**F**rom **B**elow) views, i.e., radiographic images taken with the X-ray tube directly below the breast (Arm angle between +170° and +185°), are presented in deviation to this practice and have the axillary region in the lower part of the monitor.

As a consequence, except for the case of FB views, the View and Laterality indication is NOT positioned near the axilla.

Note:

If the Operator has performed rotations or flips to the image on the Viewer, the axilla might be in a different position from that stated above. The Operator can always use the "Display Normal" function to restore the initial image display. In any case, the rotations and flips applied to the images are not stored at exam closure.

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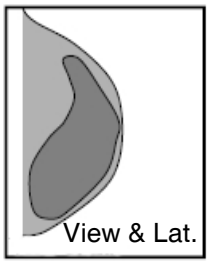
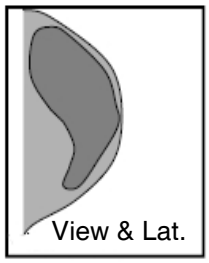
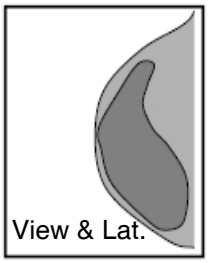
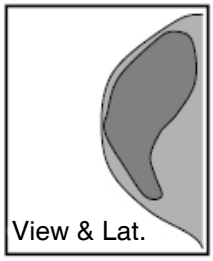
The table below clarifies the orientation of images and their respective View and Laterality marker positions on the AWS monitor:

General case for Left Views	Axilla View and Laterality label incorrectly positioned. 
LFB	 Axilla
General case for Right Views	 Axilla View and Laterality label incorrectly positioned.
RFB	 Axilla

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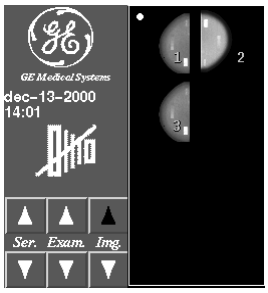
1-2 Mosaic Image Browser



The Mosaic Image Browser shows the content of the current exam in the form of thumbnail (reduced size) images. Up to eight such images can be displayed at one time.

If the current exam contains more than eight images, use the *Img.* up/down arrow buttons to scroll through the full set.

To view images from the next or previous Series or Exam, use the corresponding up-down arrow buttons (***Ser.*** or ***Exam.***).

Note:

If both routine (non-stereo) and stereo series/exams co-exist for a patient, and you start the review with a routine series/exam, you will not be able to access stereo series/exams.

Click the desired image in the Mosaic Image Browser to display it in the viewing area.

A white dot in the top left of the reduced image in the Mosaic Image Browser identifies the currently displayed image.

A camera icon appears above the arrow buttons when the Viewer is being used for image acquisition. When the Viewer is used for image review, the icon appears with a bar, and image acquisition is inhibited.

1-3 Image selection

To work on an image in the viewing area, it must be *selected* (active). To select an image, click anywhere on it. The currently selected image is identified by a large white dot in the upper left corner of its thumbnail.

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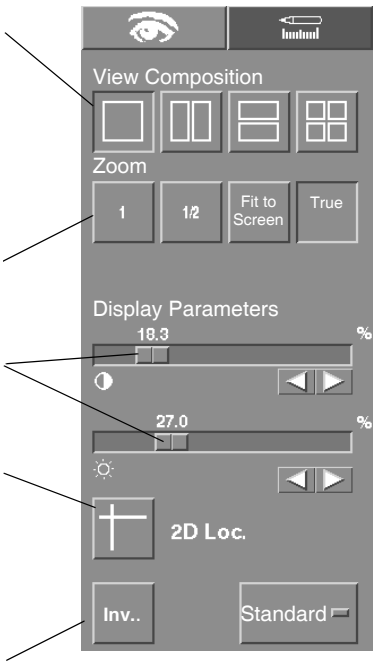
2 View Control

To use the *View Control* Panel, click the ***View Control*** icon to highlight it.



- *View Composition*. Click the appropriate icon to display a single image, two images side by side, two images one above the other, or four images.
  Images are arranged in order (left to right, top to bottom) according to the order in which they were acquired. To display images on the monitor according to the ACR standard, they should therefore be acquired in the order: RCC, LCC, RMLO, LMLO.
- *Zoom*. Click the appropriate Zoom icon to choose a Zoom factor. See *2-1 Zoom on page 169*.
- *Contrast* *and Brightness* (window width and window level, respectively) sliders. See *2-2 Contrast and Brightness sliders on page 170*.
- *2D Loc.*. Click this icon to display horizontal and vertical lines on the screen; they can be moved with the mouse to identify a particular position on the image. This facility is available only in acquisition mode (with the camera icon displayed in the Mosaic area). See *2-3 2D Loc. - electronic Cross-hairs on page 170*.
- *Image Control*. Use these controls to choose appropriate display parameters. See *2-4 Image control on page 171*.

2-1 Zoom

When the image is first displayed in the viewing area, it appears with a Zoom factor called “Fit to Screen”. The Zoom factor is calculated so that all of the image appears in the space available in the viewing area. Zoom factor is the ratio of a linear dimension in the display to a linear dimension in the image projected onto the digital detector. Hence, at a zoom factor of 3, an object having a size of 1 cm when projected to the detector plane will be displayed with a size of 3 cm.

- Click the appropriate Zoom button to select the desired Zoom factor:
  - *Zoom=1* corresponds to a full resolution display: each pixel on the screen corresponds to a pixel on the Digital Detector. The image appears at the zoom factor 3.0 compared to the original breast image projected onto the Digital Detector.
  - *Zoom=1/2* corresponds to a half resolution display: a pixel on the screen corresponds to the average of 4 pixels on the Digital Detector. The image appears at the zoom factor 1.5 compared to the original breast image projected onto the Digital Detector.
  - *Fit to Screen*: the image appears at a Zoom factor that optimizes the screen layout.
  - *True*: the image on the screen appears with the same size as that of the original breast image projected onto the Digital Detector, i.e. at the zoom factor 1.0. This facility is not available when viewing SCPT images.

CAUTION

When a small image and a large one are displayed side by side, both with zoom "Fit to Screen", there is no consistency in size between them, as a different zoom factor is applied to each of them.

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2-2 Contrast and Brightness sliders

To use the contrast and brightness sliders for precise adjustment of image contrast and brightness, you can:

- Select the slider cursor (small box inside the slider bar) and drag it left or right as required. The value above the slider changes accordingly (higher values indicate less contrast or increased brightness) and the screen displays the change in contrast or brightness.
- Click the left arrow or right arrow buttons, just below each slider, to change contrast or brightness by small increments.
- Click inside the slider bar, on the left or on the right of the cursor, to change contrast or brightness by large increments.

The adjustment only acts on the currently selected image (primary selection, indicated by the large white dot in the top left corner).

Note:

You can also use the auto windowing selection button (see *2-4 Image control on page 171*) or the Multi-Function mouse button for contrast and brightness control (see section *4-7 Middle Mouse button on page 186*).

2-3 2D Loc. - electronic Cross-hairs

In acquisition mode (with the camera icon displayed in the Mosaic area), the 2D Loc. function allows you to display and position a set of electronic Cross-hairs on the image.
These are used on images acquired using one of the optional 2D localization paddles (graduated 2D large localization paddle or 2D spot localization paddle) to precisely locate a point of interest on the image, in order to introduce a needle or to position a marker for a tangential view. For full details about the 2D localization procedure, see Chapter 25 *2D Localization examination*.

- Click the *2D Loc.* button to display the electronic cross-hairs on the image.
- Move the mouse pointer onto the intersection of the electronic cross-hairs, then press and hold the left mouse button. The cursor changes to a pencil shape; move the Cross-hairs by moving the mouse.
  Move the electronic cross-hairs exactly over the point of interest; you can now read their position relative to the graduations of the compression paddle on the image. It may be necessary to first apply a Zoom level of 1 or 1/2 to view the area of clinical interest, then to reduce the zoom level to see the paddle alpha-numerics for Cross-hair location.
- Click the *2D Loc.* button again to remove the electronic Cross-hairs.

Note:

When you close the exam (*Exit with save*), any 2D Localization electronic Cross-hairs on an image will be saved with the image, and will be available for display again when the image is selected for review at a later stage. On an image that has been saved on the database and is recalled in image review mode, the 2D Localization electronic Cross-hairs can no longer be modified or deleted. However, they can be alternately displayed or hidden by clicking the *2D Loc.* button.

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2-4 Image control

Invert

Click the **Inv.** button to invert the image contrast and brightness values, so that any microcalcifications present appear black. Press the button again to return the display to the original default values, so that microcalcifications appear white.

Auto Windowing

- Four windowing values are stored with the image: *Standard*, *High*, *Low*, and *User*. Use the Medical Application Preferences Auto Windowing panel (see Chapter 18 *Browser*) to select which of these values is used by default when first displaying an image in the Viewer. When *User* is selected, the system automatically optimizes the contrast (Window Width (WW)) of the image and uses this value as the default *User* value if it is less than the *Standard* value. When *User* is selected, and the WW value computed is greater than the *Standard* value, the *Standard* setting is used instead. The *User* level can be overwritten if the Operator saves the image with modified levels.

  User behavior described above is only when TE processing is applied. However, if Premium View is enabled (see *8-3-9 Image Process. on page 146*), selecting *User* value is considered as if *Standard* value was chosen.
- The button at the bottom right of the View Control panel shows the name of the windowing value currently applied. To change it, click the button and select the desired setting from the drop-down menu.

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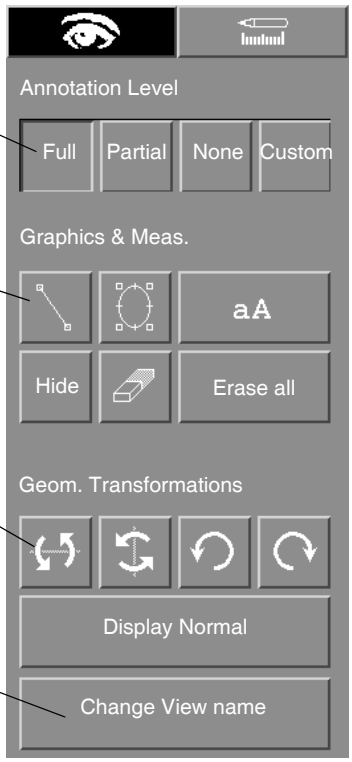
3 Annotation

To use the Annotation Level Control Panel, click the Annotation “pencil” icon to highlight it.



Annotation Level. Click the appropriate icon to select the required annotation level. See *3-2 Annotation Level on page 174*.

Graphics and Measurements. Click the appropriate icon to select and display a measurement tool, to add annotations, or to hide or erase displayed tools and annotations. See *3-3 Graphics and measurements on page 175*.

Geometric Transformations. Click the appropriate icon to flip or rotate the image, or on the *Display Normal* button to return to the original display. See *3-4 Geometric transformations on page 177*.

Change View name. Click the *Change View name* button to make a correction to Laterality and View name, if these were incorrectly selected on X-Ray Console. See *3-5 Change View name on page 178*.

3-1 Annotation Content

Annotations available on the image are:

- Patient information (Name, ID, date of birth, age, Laterality, view name)
- Acquisition date and time
- Hospital information
- X Ray parameters (Entrance Skin Exposure, Average Glandular Dose, mAs, kV, Focal Spot, Track, Filter, Thickness, Compression force, exposure mode)
- Anatomical information (Magnification factor)
- Processing information (Type*, date and time)
- Display parameters (window width, window level, zoom factor, image size, FOV)
- Measurements (annotations associated with measurements)

* Processing type depends on settings made in *Medical Application preferences* panel (see section *8-3 Medical Application preferences on page 140* in Chapter 18 *Browser*). In case Premium View is not enabled, Thickness Equalization applies, or Auto-contrast for specific cases.

Cases when Thickness Equalization cannot apply are described in section *2 Processing on page 191* in Chapter *22 Image processing and display*.

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Processing type displayed on the image can be one of the following:

- **PROC_0**, meaning that:
  - Fine View processing not applied before the raw image
  - **Auto-Contrast** processing applied on the raw image.
- **PROC_1**, meaning that:
  - Fine View processing not applied before the raw image
  - **Thickness Equalization** processing applied on the raw image
- **PREMIUM_VIEW**, meaning that:
  - Fine View processing not applied before the raw image
  - **Premium View** processing applied on the raw image
- **PROC_0_FV**, meaning that:
  - Fine View processing applied before the raw image
  - **Auto-Contrast** processing applied on the raw image
- **PROC_1_FV**, meaning that:
  - Fine View processing applied before the raw image
  - **Thickness Equalization** processing applied on the raw image
- **PREMIUM_VIEW_FV**, meaning that:
  - Fine View processing applied before the raw image
  - **Premium View** processing applied on the raw image

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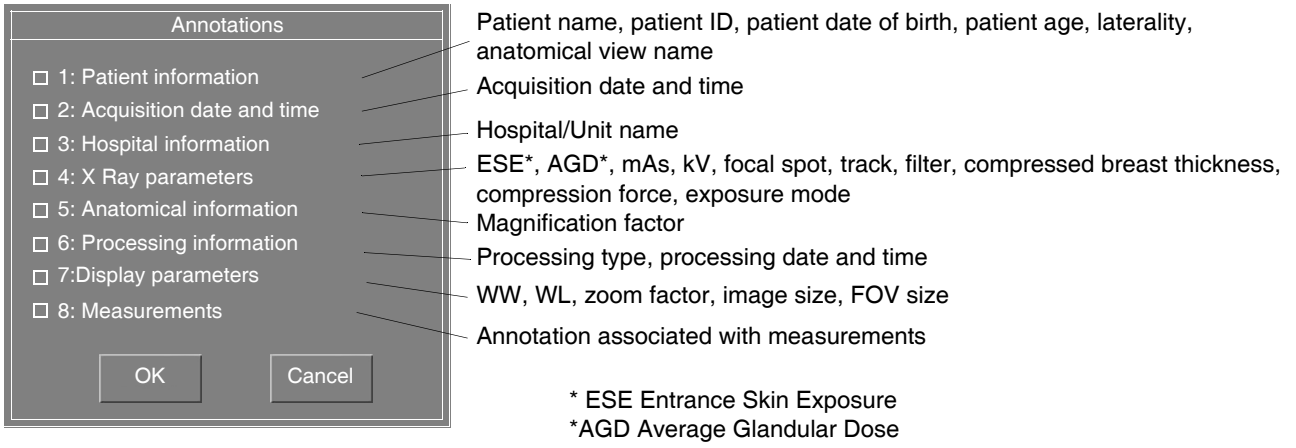
3-2 Annotation Level

Image size and FOV size are symbolized by [ ] and #, respectively. For example, when the 13 x 18 FOV is used, the annotation is [ ] 19 x 23 # 13 x 18.

System annotations are displayed automatically. They show exam-related information such as patient name, patient ID, kV and mAs used, window width (WW) and window level (WL), etc. The Operator can add further annotations (see section *3-3 Graphics and measurements on page 175*).

- To select which annotations are displayed, click the desired button on the control panel:
  Full: All annotations are displayed.
  Partial: A predefined subset of annotations appears. This facility is not available when viewing SCPT images.
  None: No annotation appears on the image.
  Custom: This button opens the Custom window (shown below) with the list of available annotation groups. This facility is not available when viewing SCPT images.

Custom Annotations window:


Annotations
1: Patient information
2: Acquisition date and time
3: Hospital information
4: X Ray parameters
5: Anatomical information
6: Processing information
7:Display parameters
8: Measurements
OK
Cancel
Patient name, patient ID, patient date of birth, patient age, laterality, anatomical view name
Acquisition date and time
Hospital/Unit name
ESE*, AGD*, mAs, kV, focal spot, track, filter, compressed breast thickness, compression force, exposure mode
Magnification factor
Processing type, processing date and time
WW, WL, zoom factor, image size, FOV size
Annotation associated with measurements

* ESE Entrance Skin Exposure
*AGD Average Glandular Dose

- A check box appears next to each group. To select the annotation groups that you want displayed, click the corresponding check box. To deselect a group, click the button a second time.
- Click the ***OK* button** to use the selected annotations, or the ***Cancel* button** to cancel the operation.

CAUTION

When there is no consistency in size between images displayed side by side, there will be no indication of relative size if the display parameters (zoom factor, image size and FOV size) are hidden.

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3-3 Graphics and measurements

These buttons allow you to add graphic and text annotations to the image, and perform measurements.

You can add several graphic annotations (line segments and ellipses) to the same image. Each annotation is identified by a number, which appears next to the annotation. The corresponding measurements, with the same identification number, are displayed in the bottom right corner of the image. Only the three most recent measurements are displayed.

In Review mode, you must select the graphical annotations added in acquisition mode in order to display the measurements.

To recall an earlier measurement value on the screen, click the corresponding line segment or ellipse.

Segment

- Click the ***Segment*** button to place on the image a line segment that you can use to measure the distance between two points.

  - The squares at each end of the segment are called *handles*.
  - Press and drag on either of the handles to move the corresponding end of the segment to the desired position. The size and angle of the segment follow the movement of the handles.
  - To move the whole segment, select the segment by clicking on any point along the line (except the handles) and drag the segment to the desired position.

  The length of the segment (in millimeters) and the angle between the segment and the vertical (in degrees) are displayed in the bottom right corner of the image.

Ellipse

- Click the ***Ellipse*** button to place on the image an ellipse, that you can use to highlight an area of interest, or to measure the area delimited by the ellipse.

  - The ellipse appears with four handles around it, four tick marks on the ellipse itself, and a cross mark in the center.
  - To change the size and shape of the ellipse, press and drag on the handles.
  - To rotate the ellipse around its center, press and drag on any of the tick marks.
  - To move the actual ellipse, press anywhere on the ellipse (except for the tick marks), or on the center cross, and drag the ellipse to its desired position.

  The area of the ellipse (in square millimeters), and the mean and standard deviation of the pixel values within the ellipse, are displayed in the bottom right corner of the image.

CAUTION

All measurement calculations for graphical annotations (length, surface area, etc.) are made in a reference plane which is 2 cm above the breast contact surface. These values therefore do not correspond to the true size of a pathological feature unless it is situated in the reference plane.

Pixel gray levels in raw images are linearly proportional to the X-ray dose received by the detector. Gray levels in processed images are proportional to the logarithm of the dose.

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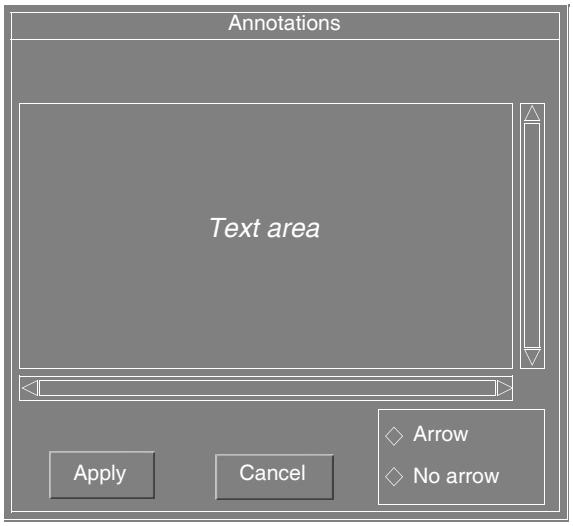
Text annotation

- This function allows you to add text annotations on the image, for example to highlight a specific point for further reference, or as a communication tool for another practitioner.
  Click the **aA** button to open the ***Annotations*** window, shown below:



- Move the mouse pointer inside the text area, and type the required text.
- Press the <Enter> key to start a new line. To make corrections, move the mouse pointer to the desired place and click, to position the text cursor. You can now insert text, or press the <Backspace> key to delete text.
- An arrow pointing to the area of interest can be attached to the annotation. To do this, enable the Arrow check box.
- When you have entered the desired text, click the ***Apply*** button. The ***Annotations*** window closes, and the text annotation appears on the image.
- To position the text annotation, click it to select it, and then drag it to the desired position.
- If you chose to attach an arrow, you can now also click the tip of the arrow and drag it to the desired position. The length of the arrow is adjusted automatically.

Note:

Annotations added by the Operator on the AWS are present only on the AWS and on images printed from the AWS. They are lost during image transfer to another workstation.

Displaying and Removing User Annotations

To hide all Operator annotations (graphics and text) on an image *temporarily:*

- Click the ***Hide/Show*** button.
- To display the annotations again, click the button a second time.

  The button legend alternates between **Hide** and **Show**. When **Hide** is selected, other measurement tools are not available.

To delete a Operator annotation (graphic or text) *permanently*:

- Select the annotation by clicking on it. The annotation is highlighted.
- Click the ***Eraser*** button to delete the highlighted annotation.

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To delete ALL USER annotations (graphics and text) present on the image ***permanently***:

- Click the ***Erase all*** button. You are asked to confirm the deletion (**Yes or No).**

Note:

The system annotations cannot be deleted, but you can use the Annotation Level buttons to set the amount of system annotation displayed. See section *3-2 Annotation Level on page 174*.

3-4 Geometric transformations

The buttons in this area of the panel allow you to flip or rotate the image to improve viewing comfort or for easier comparison with other images.

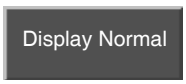
- Click the button for the desired action:
  - Flip image around horizontal axis. The top of the image becomes the bottom, and vice-versa. Left/right orientation is unchanged.

  - Flip the image around vertical axis. The left of the image becomes the right, and vice-versa. Up/down orientation is unchanged.

  - Rotate the entire image 90 degrees to the left.

  - Rotate the entire image 90 degrees to the right.

- Click Display Normal to return the image to the initial orientation (regardless of how many flip and rotate operations were performed).



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3-5 Change View name

3-5-1 Overview of Change View name

It may occur that when viewing an image, the Operator realizes that the View name displayed is incorrect. The Change View name function allows the Operator to modify the Laterality and View name of an image just acquired without repeating the exposure.

- The function is not available in stereotaxy mode.
- The function is available in (active) Acquisition mode only, not in Review (i.e., only before the examination is closed).
- Laterality and View name changes can be applied to:
  - The raw and processed images just acquired.
  - Any re-processed images of the current examination.

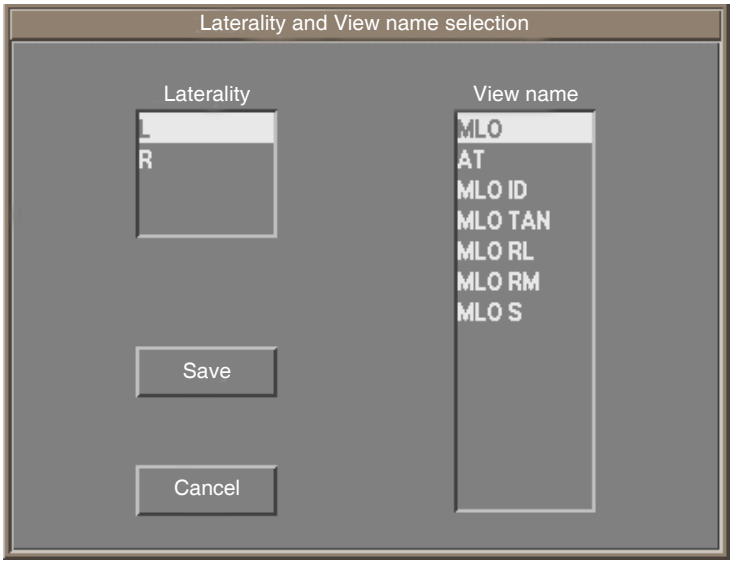
Note:

For recumbent patients, View names can only be changed to recumbent View names. For standing patients, View names can only be changed to standing View names. To change the View name from recumbent to standing, or vice-versa, the exposure must be repeated.

3-5-2 How to use Change View name

Assuming that you have already taken an exposure and obtained the raw and processed images, proceed as follows:

- Check the Laterality displayed on the image. If you find that you have incorrectly selected it on the X-ray Console, then proceed to the steps given below.
  - Before closing the exam, open the *Annotations* panel.
  - Click *Change View name* button: The *Laterality and View name selection* dialog box appears.



In example above: Default selections of Laterality and View name are displayed in the panel for an image acquired with Laterality = L and positioner angle = - 35°

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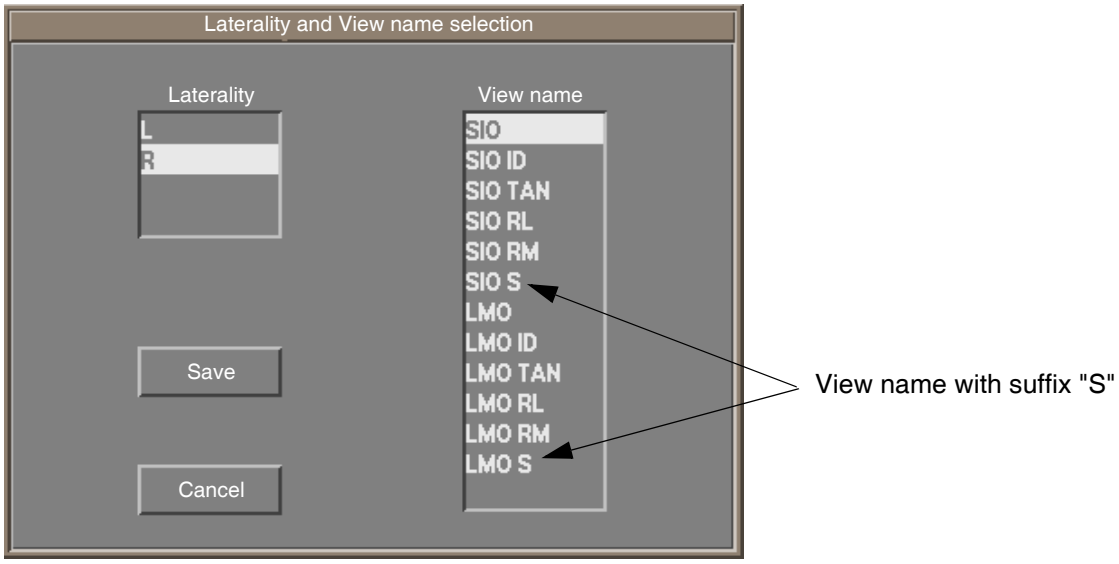
- In this panel, select the correct Laterality (R in the present example) and the View name.
  The list of Laterality/View name available depends on position of the Gantry; see section *3 .View names code chart on page 114* in Chapter 15 *View name selection* for the complete list in all positioner configurations.



New View name list after Laterality selection = R
for an image initially acquired with Laterality = L and positioner angle = -35°

Note:
The view prefix cannot be modified: if a Magnification stand was present for the image acquired, the prefix ("M") is automatically kept for the View name.

CAUTION

The view suffix can be modified as desired unless the acquisition has been done with a spot compression paddle (with or without magnification). In that case, select only a View name with suffix "S". On the other hand, if the acquisition was NOT done with a spot compression paddle, DO NOT select a new View name with the suffix "S". If these directions are not followed, there is a risk of inconsistency with the processing applied.

- At this point, you can either Cancel or Save the selection:
  - If you click the *Cancel* button, the Laterality for the raw, processed, and all reprocessed images from this raw, remains as previously selected (i.e., "L" in the present example).
  - If you click the *Save* button, the new Laterality applies for the raw, processed and all reprocessed images from this raw file (i.e., "R" in the present example).

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3-5-3 Resulting image display

The currently displayed image may be rotated by 180° on the monitor, depending on the chosen View name, as described in the table below:

New View name selected	Laterality chosen	Impact on image display on the monitor
CC XCCM XCCL FB	R	The image appears with chest wall on the RIGHT.
	L	The image appears with chest wall on the LEFT.
CV MLO AT SIO LMO LM ML	Does not matter.	180° rotation is not applied.

3-5-4 Printing the image

The new Laterality and View name are taken into account when the image is printed:

- The new Laterality and View name are printed.
- The printed image is consistent with the image displayed in the Viewer (if chest wall side appears on the right of the Viewer, it is printed on the right of the film as well).

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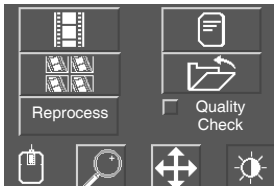
4 Function panel

The Function Panel is used to exit from the Viewer, as well as for access to information on the *Medical Procedure Card*, *Scrapbook*, *Quality Check, Image reprocessing*, *Print* , and *Middle mouse button* functions.



4-1 Medical Procedure Card

Click this button to view information on the currently selected patient.

4-2 Scrapbook

Click this button or press the **<F3>** keyboard button to open the Scrapbook. This allows you to position selected images on Scrapbook “pages”, ready for printing. See section *5 Scrapbook on page 187* for more information.

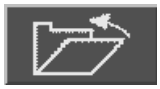
4-3 Reprocess

Click this button to apply the selected processing algorithm to the currently selected image. If the image has already been correctly processed, or if it is an SCPT image, the operation will have no effect on the image, but a new processed image, identical to the first one, will be created.

Depending on the processing selected (PV or TE), you can select the alternative processing under *Tools / Medical Application Preferences* and then reprocess the raw image to have both TE and PV.

4-4 Close exam (Exit Viewer)

Click this button to leave the Viewer and return to the Browser. If an exam has been reviewed with no changes, the Viewer closes with no message.



- If changes have been made to image WW or WL, a confirmation box appears (***Exit with save***, ***Exit without save***, ***Cancel***).
- If New Acquisition has been selected, but closed before images were acquired, a confirmation box appears (*Yes* or *No*).

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4-5 Quality Check

Two cases are possible for the Quality Check function: With Repeat and Reject Analysis (RRA) either enabled, or disabled.

4-5-1 Case 1: RRA enabled

4-5-1-1 Introduction

If you determine that an image is of satisfactory quality, the qualification level Accepted is applied by default, and Auto Push and/or Auto Print transfers are triggered according to the settings in the Medical Application preferences window when the exam is closed.

On the other hand, if you determine that an image has to be repeated or rejected, you must qualify it as such.

In all cases, each image's qualification level is recorded in a specific database when the exam is closed.

You can apply one of three qualification levels to an image:

- Accepted (default level),
- Repeated,
- or Rejected.

The consequences on image transfer (Auto Push and Auto Print) are applied as indicated in the next table:

QUALITYCHECK Buttons		
First Selection	**Second Selection**	**Consequence on Image Transfer**
QUALITYCHECK OK	Accepted (default level)	Auto Print and/or Auto Push, according to settings in Medical Application preferences window.
QUALITYCHECK NOK	Repeated (selected level)	If Auto Print/Auto Push are set to **ON** in the *Medical Application preferences* window: Auto Print/Auto Push functions behave according to the settings in the **Quality Check** panel in the *Medical Application preferences* window. If Auto Print/Auto Push are set to **OFF** in the *Medical Application preferences* window: Auto Print/Auto Push functions do not operate, regardless of the settings in the **Quality Check** panel in the *Medical Application preferences* window.
	Rejected (selected level)	

Qualification does not modify the image itself; it only records the applied image qualification level in a specific database on the AWS. All qualification statistics are generated from this database.

Rejected images

Most of the time these are non-clinical images, such as Calibration or Quality Control (QC) images. Occasionally a clinical image may not be worth keeping or the Operator will choose not to retake the same view.

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Repeated images (to be retaken)

In the RRA feature, Repeated means that the corresponding view will have to be retaken, or has been retaken. An image can be qualified as Repeated either before or after the view has been retaken.

It is the responsibility of the Operator to actually retake the exposure. The examination should not be completed before the exposure has been retaken.

Repeated or Rejected images

Images qualified as Repeated or Rejected are not deleted from the AWS database.

Even in the specific case with:

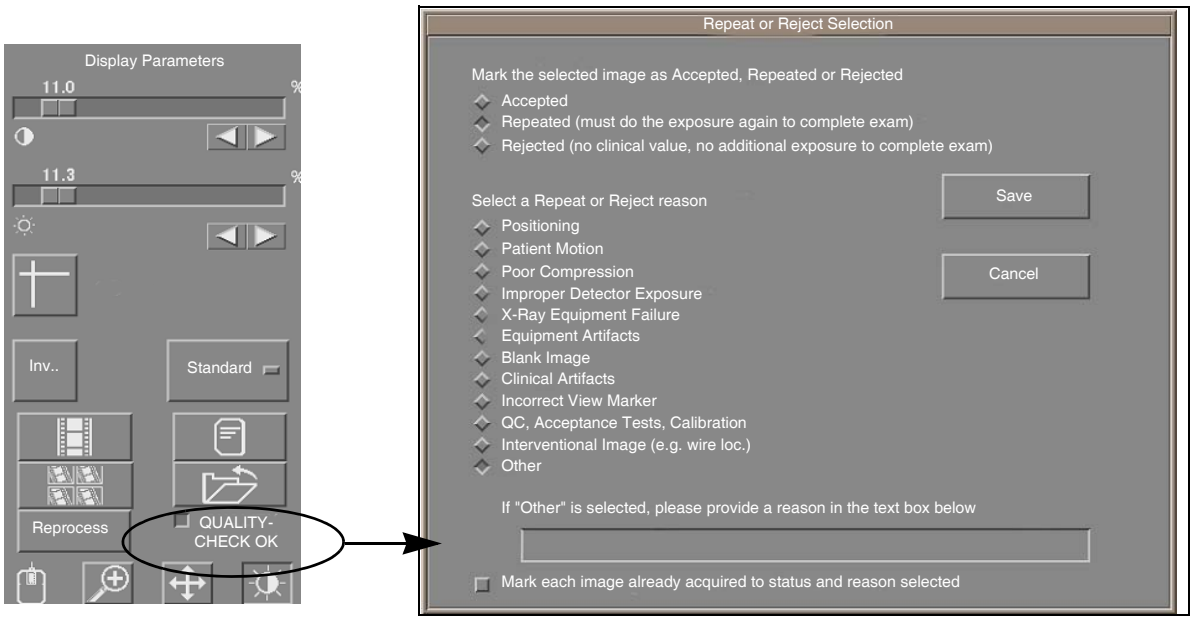
- **Auto Push Repeated images?** and **Auto Push Rejected images?** both set to **No** in *Medical Application preferences*, *Quality Check* part (see section *8-3-5 Quality Check on page 143* in Chapter 18 *Browser*),
- *Storage commitment* activated on the station,
- *Auto delete: ON*,

the Repeated and Rejected images are not deleted unless they are manually pushed to a remote DICOM-compatible host (e.g. review workstation, Computer Aided Detection (CAD) system, or mass archiving system). Subject to automatic deletion, therefore, they must be either deleted manually or pushed manually to a remote DICOM-compatible host (e.g. review workstation, Computer Aided Detection (CAD) system, or mass archiving system).

4-5-1-2 Procedure to qualify an image

1. While viewing a processed image in acquisition mode, the interactive QUALITYCHECK current level status in the Viewer Function panel indicates the current level (QUALITYCHECK OK or QUALITYCHECK NOK): default level is QUALITYCHECK OK.

   If you decide that the quality of an image is not satisfactory, click the interactive QUALITYCHECK current level status (QUALITYCHECK OK) to open the *Repeat or Reject Selection* window:



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2. Qualify the image as either Repeated or Rejected, then select the associated reason in the list provided. If the reason chosen is Other, a text field is available to type in a customized reason.

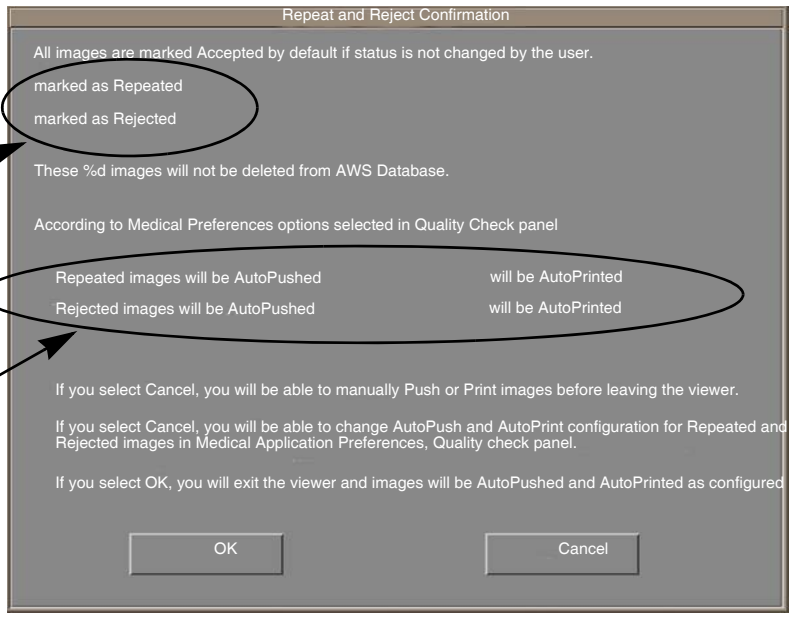
   To apply the same status and reason to all images already acquired, select the "Mark each image already acquired to status and reason selected" check box.

   Click the ***Save*** button: If Repeated or Rejected was selected, the interactive QUALITYCHECK current level status now indicates QUALITYCHECK NOK.

   This new qualification level is applied to both images (raw and processed):

Image Qualification

Planned Auto Push and Auto Print actions, as defined in Medical Application Preferences, Quality Check part.


Repeat and Reject Confirmation
All images are marked Accepted by default if status is not changed by the user.
marked as Repeated
marked as Rejected
These %d images will not be deleted from AWS Database.
According to Medical Preferences options selected in Quality Check panel
Repeated images will be AutoPushed
will be AutoPrinted
Rejected images will be AutoPushed
will be AutoPrinted
If you select Cancel, you will be able to manually Push or Print images before leaving the viewer.
If you select Cancel, you will be able to change AutoPush and AutoPrint configuration for Repeated and Rejected images in Medical Application Preferences, Quality check panel.
If you select OK, you will exit the viewer and images will be AutoPushed and AutoPrinted as configured
OK
Cancel

3. After all images are qualified as desired, close the examination. The *Repeat and Reject Confirmation* dialog box appears before closing, summarizing the image qualification and the planned Auto Push and Auto Print actions.
4. Once you agree with the content of the *Repeat and Reject Confirmation* dialog box, click the ***OK*** button. The dialog box for the final exit then appears.

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4-5-2 Case 2: RRA disabled

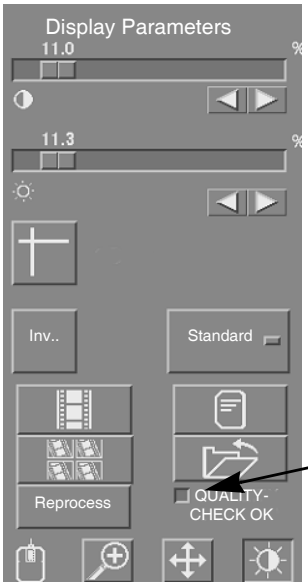
4-5-2-1 Introduction

You can apply one of two qualification levels to an image: QUALITYCHECK OK or QUALITYCHECK NOK, with the consequences on image transfer (Auto Push and Auto Print) as indicated in the table below:

QUALITYCHECK current level status	Consequence on Image Transfer
QUALITYCHECK OK	Auto Print and/or Auto Push, according to settings in *Medical Application preferences* window.
QUALITYCHECK NOK	Auto Print/Auto Push functions do not operate.

4-5-2-2 Procedure to qualify an image

While viewing an image (raw or processed) in acquisition mode, the interactive QUALITYCHECK current level status in the Viewer Function panel indicates the current level (QUALITYCHECK OK or QUALITYCHECK NOK). Click the interactive current level status to toggle the image qualification between the two possible levels (see illustration below). The new level is applied to both images (raw and processed).



Click here to toggle current level status

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4-6 Print

Click this button to print the displayed image. See Chapter 23 *Printing*.

4-7 Middle Mouse button

Click one of the buttons on this panel to select one of three functions to be performed by the middle mouse button. See below for descriptions of these functions; the default is Contrast/Brightness control (WW/WL).

4-7-1 Magnifying glass

Provides a magnified view of part of the image in a moveable square zone.

If the initial zoom of the image is *True*, *Fit to Screen* or *Zoom=1/2*, zoom factor inside the magnifying glass is 3, which corresponds to a full resolution display (each pixel on the screen corresponds to a pixel on the Digital Detector).

It the initial zoom of the image is *Zoom=1*, zoom factor inside the magnifying glass is 6, which corresponds to a double resolution display (a pixel on the digital detector appears on 4 pixels on the screen).

- To select the magnifying glass function, click with the left mouse button on the **Magnifying glass** button.
- To use the function, move the mouse pointer to the part of the view you are interested in; press and hold the *middle* mouse button.

  Any annotations or graphics in the magnified zone temporarily disappear.

4-7-2 Image scroll

When all of an image is not visible, for example when you have magnified an image by using the Zoom function, this function allows you to move the visible window around the image.

- To select the image scroll function, click with the left mouse button on the ***Scroll*** button.
- To use the scroll function, move the mouse pointer onto the view; press and hold the middle mouse button to move the image as required.

  If the full content of the image is already displayed, the Image Scroll function has no effect.

4-7-3 Contrast/Brightness control

This function allows image contrast and brightness to be adjusted by moving the mouse.

- To select the contrast/brightness function, click with the left mouse button on the ***Contrast/ Brightness*** button.
- To use the contrast/brightness function, move the mouse pointer onto the view; press and hold the middle mouse button:
  Contrast is controlled by a horizontal movement of the mouse, to the left for more contrast, and to the right for less.
  Brightness is controlled by a vertical movement of the mouse, up to decrease brightness, and down to increase it.

Note:

Image contrast and brightness can also be adjusted using the Contrast and Brightness sliders, or the Auto Contrast control, all available from the *View Control* Panel.

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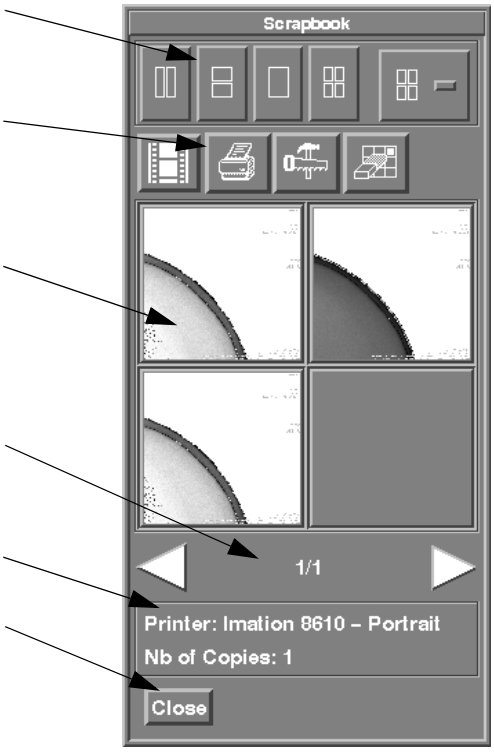
5 Scrapbook

CAUTION

The Scrapbook function allows more than one image to be printed on a single film for ease of comparison and reference. DO NOT use any images printed from the Scrapbook for diagnostic purposes.
Be aware that there is no consistency in size between small and large images printed side by side from the scrapbook.

- The Scrapbook function allows you to select images and arrange them in any desired order for printing, by positioning them on “virtual pages” in the Scrapbook. Pages can contain multiple images, according to the layouts available with the currently selected printer, and each page can have a different layout. Pages can be sent for printing individually or all at once.
- A “delete after print” option can be turned on or off, as required, which causes pages to be automatically deleted after printing, when turned on.
- Only images from a single patient can be loaded into the Scrapbook at one time. Images may be loaded from different exams; a warning appears when the first image of the new exam is loaded.
- To use the function, either click the *Scrapbook* button on the Viewer Control Panel (see section *5-2 Scrapbook functions on page 188*) or press the <F3> keyboard function button. The *Scrapbook* window appears:
- *Layout Formats.* Use these buttons to select the format desired for the current page. See *5-1 Layout formats on page 188*.
- Scrapbook *functions*. Use these buttons to select Scrapbook functions; *Print, Print Menu*, *Options Menu,* and *Delete Menu.* See *5-2 Scrapbook functions on page 188*.
- *Composer area*. This area shows the contents of the current Scrapbook page. It is divided into slots for images, according to the selected layout for the page. Use this area to add and remove Scrapbook images. See *5-3 Composer area on page 189*.
- *Page navigation area.* Use the arrows to display the next or previous pages. See *5-4 Page navigation area on page 189*.
- *Printer information area.* Shows the current printer settings.
- *Close button.* Use this button to close and empty the Scrapbook. If the Scrapbook contains unprinted images, a warning dialog box asks for confirmation of the Close action.



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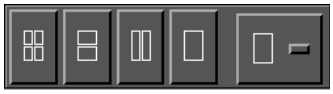
5-1 Layout formats



Layout Formats. Four Operator-defined buttons show available formats for page layouts. These are usually: 2 x 2, 1 x 2, 2 x 1, and 1 x 1.
Select the format desired for the current page by clicking on the appropriate button.

- If the currently selected printer has been configured to allow more than four layouts, the additional layouts can be selected in two ways:
  - Click the fifth (rightmost) button to display a menu of all page layouts available for the current printer; select the desired layout from the menu to apply it to the current page.
  - The Operator-defined buttons can be reprogrammed to select different layouts; see *Options Menu* in section *5-2 Scrapbook functions on page 188*.

5-2 Scrapbook functions

Print

Click this button to print all pages of the Scrapbook.

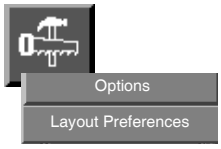
Print Menu

Click this button to display a menu of print options:

- *Print page*: Prints the contents of the current Scrapbook page.
- *Print all pages*: Prints all pages of the Scrapbook.
- *Printing status:* Displays the Printing status panel (see Chapter 23 *Printing*).
- *Printer Configuration*: Displays the Print Manager panel.

Options Menu

Click this button to display a two-line pull-down menu:



- Select *Options* to display a checkbox which allows you to enable or disable the “delete after print” option.
- Select *Layout Preferences* to display a menu of all page layouts available for the current printer. To reprogram one of the Operator-defined layout buttons (section *5-1 Layout formats on page 188*), select the desired format and apply it to the button by “drag and drop”.

Delete Menu

Click this button to display a two-line pull-down menu:

- Select *Delete Page* to remove the current page from the Scrapbook.
- Select *Delete All Pages* to remove all pages from the Scrapbook.

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5-3 Composer area

This area displays the image or images held on the current Scrapbook page in thumbnail (reduced size) form. Each thumbnail displays the full image, with the same settings (brightness, contrast, invert, rotate, and flip) and the same graphic annotations as the image displayed in the Viewer. However the Zoom and the position of the image if it has been roamed in the Viewer are not taken into account, either for display or when printing.

Use the area to add and remove Scrapbook images:

- Use the right mouse button to “drag and drop” an image from the Mosaic Image Browser to an empty slot on a Scrapbook page displayed in the Composer area.
- Press the keyboard function key <F4> to load the image currently displayed in the Viewer into the next free slot of the current page of the Scrapbook. If there is no free slot, a new empty page is created and displayed, with the same layout format as the current page.

  If the Scrapbook is not open, the <F4> key has no effect. If the mouse cursor is left over the Scrapbook window, the <F4> key has no effect.
- To remove an individual image from the Scrapbook, click with the right mouse button on the thumbnail image in the composer area, and answer Yes to the *delete confirmation* dialog box which appears.

5-4 Page navigation area

- This area displays the current page number and the total number of pages in the Scrapbook, and contains two navigation arrows:
- Click the left arrow to display the contents of the previous page; if the current page is the first page, a warning message appears.
- Click the right arrow to display the next page. If the current page is the last one, a new empty page is created and displayed, with the same layout format as the current page.

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Chapter 22 Image processing and display

1 Raw image

- After making an exposure, the image acquired by the Digital Detector is automatically transferred to the work-station, added to the exam and displayed on the Viewer screen as a raw image with low contrast. During the transfer of the raw image all Operator interface functions are disabled.
- *Fine View processing* is applied to the raw image.

  This increases the sharpness of the image. Allthough *Fine View* processing is applied before the raw image is saved and displayed, the effect is not visible at this stage, because the raw image appears with low contrast.

  Fine View processing is selected as an option under Medical Application preferences (See section *Medical Application preferences on page 140*).

  Fine View processing must always be selected for clinical images. If *Fine View* is not selected, a warning message appears.
- The raw image is saved in the DICOM MG “for processing” format so that processing can be carried out later if required, perhaps using a hospital-specific algorithm.

2 Processing

After acquisition, a number of calculations are applied to the image to create the processed image, which then replaces the raw image on the screen.

The main calculations that are applied to create the processed image are:

- *Collimator Detection*.

  This applies a black mask around the useful image area, covering areas which would otherwise be white. It allows more comfortable viewing.
- *Pseudo-log Transformation*.

  This facilitates the manipulation of brightness and contrast during the review. After the transformation the image dynamic range is reduced to 12 bits, without loss of clinical information.
- *Auto-contrast*.

  This improves image quality by optimizing the levels of brightness (window level) and contrast (window width) in the image.
- *Thickness Equalization* or *Premium View*

  Either Thickness Equalization or Premium View processing is applied, according to the setting of the Premium View option in Medical Application preferences (See section *Medical Application preferences on page 140*):
  - *Thickness Equalization*.

    To apply Thickness Equalization processing, set the Premium View option to *Disable.*

    Subcutaneous tissues can be difficult to see on the screen because of monitor display limitations. This is corrected by applying a thickness equalization algorithm to decrease the image dynamic range. Image information beyond a threshold level of gray, selected to correspond to subcutaneous tissues, is modified for more visibility. The end result is clear visibility of the medical information in all regions of the breast. When this algorithm is used, the processing description applied is referred to as PROC_1_FV (or PROC_1 if *Fine View* is not applied).

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The Thickness Equalization algorithm is not applied to the following images:

- Magnified, Spot, and Collimated views with a Field of View smaller than 19.2 cm x 23 cm.
- Images with certain combinations of manually selected parameters.The processing description applied to these images, when the thickness equalization algorithm is not used, is referred to as PROC_0_FV (or PROC_0 if Fine View is not applied).

- *Premium View*.

  To apply Premium View processing, set the Premium View option to *Enable*. If the feature is enabled, select the preferred strength for local contrast enhancement (See section *Medical Application preferences on page 140* for more details on how to select the strength).

  This is an image-processing algorithm which increases the visibility of breast structures. The main advantage is to provide a single breast image, in which the contrast in the fatty tissues is similar to that obtained by setting WW (window width) and WL (window level) for optimum visualization of fatty tissues, and the contrast in the fibro-glandular tissue is similar to that obtained by setting WW and WL for optimal visualization of fibro-glandular tissues. The Premium View algorithm also includes a thickness equalization algorithm to enhance the visibility of subcutaneous tissues. Under certain specific conditions (e.g., particular exposure techniques) the Premium View algorithm cannot be applied.

  A Premium View image can be processed with Fine View. The image description is then PREMIUM_VIEW_FV.

Note:

Premium View is an image processing algorithm optimized for the structure of breast images.

When imaging an object with thick or sharp borders (e.g., a phantom), one might see an enhanced brightness at the border of the object. This enhancement is normal and is not expected to affect correct phantom scoring.

Note:

When acquiring implant images, the Premium View algorithm output may not be optimal. In this case, a satisfactory image display may be obtained by adjusting window level and window width, or by using the thickness equalization algorithm to reprocess the raw image.

Note:

When acquiring images with Spot paddle in Mag mode or in Contact mode, the Premium View algorithm output may not be optimal. In this case, a satisfactory image display may be obtained by adjusting window level and window width.

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3 Processed image

- After application of the selected algorithm(s), the processed image is added to the exam and replaces the raw image on the screen.
- Processed images are saved in the DICOM MG “for presentation” format, ready for review.

4 Image display

4-1 Processed image presentation

- By default, the processed image appears with the *Standard* contrast level,
- Options in the Viewer Control Panel window allow the default display level to be changed, by selection of *High*, *Low*, *Standard*, or *User* levels. For images to which Premium View has been applied, selection of the *User* level has the effect of selecting the *Standard* level, but a Operator level can be set if the image is saved with modified levels.

4-2 Image display format

Image size (raw or processed)	Number of pixels displayed
24 x 31	2394 x 3062
19 x 23	1914 x 2294

5 Next exposure

- As soon as the processed image has been transferred and displayed on the screen, the system is ready for the next exposure. The images (first raw, then processed) from the new exposure replace the previous image in the Viewer.

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Chapter 23 Printing

1 Printing conditions

1-1 Potential printers

Any GE Healthcare-recommended, high resolution, DICOM, printer can be connected to the Senographe Essential for printing hard copies of digital images. For compatible printers, see the latest product data sheets for this system, which you can obtain from your local sales Representative.

1-2 Film sizes

- Small images (19 x 23 cm) can be printed to both 8 x 10 and 10 x 12 inch film.
- Large images (24 x 31 cm) can only be printed to 10 x 12 inch film.

CAUTION

Only films formatted to print a single mammogram per sheet of film may be used for diagnostic purposes, and only images printed to 10 x 12 inch film or small images printed to 8 x 10 inch film have been validated for diagnostic purposes. Do NOT use films formatted to print multiple images per sheet of film for diagnostic purposes.

1-3 Types of images which may be printed

Only processed images can be sent for printing by the Senographe Essential, and only one image per film is available unless Scrapbook is configured and used.

1-4 Information which is not printed

Modifications made to the image (other than window width and window level) are not printed.

1-5 Printing scale

CAUTION

The size of the printed mammogram depends on the type of Workstation used to send the image to the printer, and which printing method is used to print the film. Use the following table for guidance.
Clinical studies validating full-field digital mammography performance have only been carried out using the size designated as "Reference" in the following table.

Relative Sizes of Printed Mammograms From Review and Acquisition Workstations

Workstation	Printing Method	Linear Size Comparison
RWS or Seno Advantage	Print Original Image	Reference
RWS or Seno Advantage	Print Screen	3% reduction
AWS Print Models 1, 2, 3, and 4.	Automatic or Manual Print	The reduction in size depends upon the make and model of printer, and the Print Model in use. Refer to the following table.

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Note:

Use of Print Model 3 when printing to 10” x 12” film results in a significant image reduction as compared with use of Print Model 4 (refer to the table below). We therefore advise the use of Print Model 4 as a default print model, rather than Print Model 3.

				AGFA	FUJI	KODAK	KONICA
Workstation	**Print Model**	**Image size**	**Film size**	**DryStar 4500M, 5500, 5503**	**DryPix 4000, 5000, 7000**	**DryView 8900**	**DryPro 793**
AWS	**Model 1**	**SFOV**	**8x10"**	0.2%	4.0%	3.3%	3.5%
		SFOV	**10x12"**	3.7%	3.7%	2.4%	3.9%
		LFOV	**10x12"**	4.0%	3.7%	2.7%	3.7%
	Model 2	**SFOV**	**8x10"**	0.2%	4.0%	3.3%	3.5%
		SFOV	**10x12"**	3.9%	3.7%	2.4%	3.9%
		LFOV	**10x12"**	4.0%	3.7%	2.7%	3.7%
	Model 3	**SFOV**	**8x10"**	4.1%	3.3%	1.3%	1.8%
		SFOV	**10x12"**	9.1%	7.6%	8.1%	9.1%
		LFOV	**10x12"**	9.5%	7.6%	7.7%	9.4%
	Model 4	**SFOV**	**8x10"**	4.3%	3.7%	1.3%	1.5%
		SFOV	**10x12"**	4.2%	3.7%	2.8%	3.9%
		LFOV	**10x12"**	4.3%	3.7%	2.7%	3.7%

1-6 Printing process

Printing is very simple. You can use the Auto Print function for automatic printing of newly acquired images on the closure of an exam, or manual printing to print individual images from the Viewer window.

2 Printer management

Printers are set up and declared to the system at the time of installation by your GE Healthcare Service Representative; printer information cannot be changed by the Operator.

The access to this function is from the *Tools menu* .

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3 Print functions

3-1 Auto Print

Auto Print is a function allowing the Operator to automatically initiate the printing of exam images on closure of the exam from the AWS.

Images with a Quality Check value of *OK* are automatically printed by the Auto Print function.

If RRA is installed and enabled, the printing of images with a Quality Check value of *NOT OK* depends on Quality Check settings in Medical Application preferences (see subheading *8-3-5 Quality Check on page 143* in section *8-3 Medical Application preferences on page 140* of Chapter 18 *Browser*).

If RRA is not installed or disabled, images with a Quality Check value of *NOT OK* are not automatically printed at the close of the exam.

To use Auto Print, open the *Tools menu* from the Browser (see Chapter 18 *Browser*), and select **Medical Application preferences**. Click the ***Auto Print*** button in the Medical Application preferences window to access the Auto Print set-up tool.

Facilities available from the *Auto Print* window are:

- *DICOM printers*: contains the list of all the available DICOM printers that have been declared for printing. Click a printer in the list to select it.
- *Review Rooms*: contains the list of all environmental conditions of available review rooms. Select the room corresponding to the printer. Refer to your GE Healthcare Service Representative or printer manufacturer for review room configuration.
- *Auto Print buttons*: click the On button to turn Auto Print on for the selected printer or the Off button to turn it off. The selected button becomes dark gray.
- *Save button*: click this button to confirm any changes made and close the window.
- *Close button*: click this button to close the *Medical Application preferences* window. If the Operator has made changes to the *Auto Print* window, a warning window opens requesting the Operator to use one of the following:
  - *Save* button (to save the changes and return to the Browser).
  - *Cancel* button (to cancel changes made, close the warning window and return to the *Auto Print* window).
  - *Discard* button (to close without saving the changes and return to the Browser).
- *Print mode:* only *Fit to Film*. Can not be changed by the Operator in current Senographe Essential release.
- *Film size*: either automatically selected according to image size or always 8x10" or always 10 x 12". When selecting *Automatic* for film size, if the printer takes only 8 x 10" film, a dialog box opens informing the Operator that large images will not be printed.

  When the Auto Print is performed at the close of the exam, if the printer provides only 8 x 10 inch films and if there are large images in the exam to be printed, a dialog box opens informing the Operator that large images cannot be printed.
- *Number of Copies box*: enter the required number of copies in this box.
- *Printer properties button*: click this button to open the *Printer properties* window (see section *3-3 Printer properties on page 199*).

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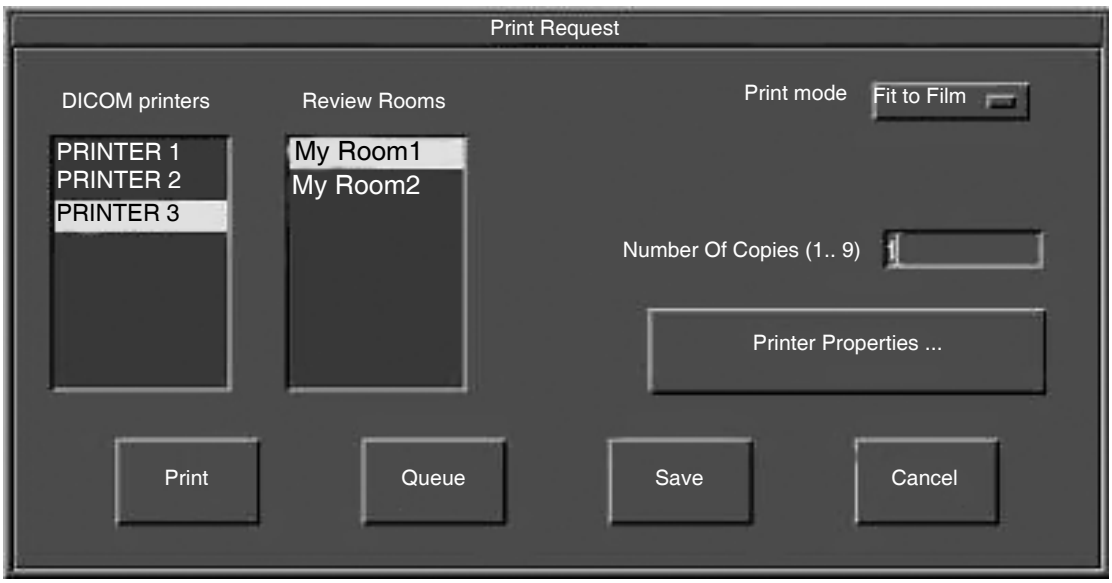
3-2 Manual Print

In addition to the Auto Print function, an image displayed on the Viewer screen can be printed at any time under manual control.

Click the Print button in the Viewer Function panel to open the *Print Request* window.



Facilities available from the *Print Request* window are:

- *DICOM printers*: contains the list of all the available DICOM printers that have been declared for printing. Click a printer in the list to select it.
- *Review Rooms*: contains the list of all environmental conditions of available review rooms. Select the room corresponding to the printer. Refer to your GE Healthcare Service Representative or printer manufacturer for review room configuration.
- *Print mode*: cannot be changed. Fit to Film only.
- *Number of Copies box*: enter the required number of copies in this box.
- *Printer Properties ... button*: click this button to open the *Printing Properties* window (see section *3-3 Printer properties on page 199*).
- *Print button:* click this button to print the displayed image on the currently selected printer and close the window. Any changes made, apart from film size, are saved.
- *Queue button*: click this button to open the *Filming Queue* window (see section *3-5 Filming queue on page 200*).
- *Save button*: click this button to confirm any changes made and close the window.
- *Cancel button*: click this button to cancel any changes made and close the window.

If the Operator tries to print a large (24 x 31) image to 8 x 10" film, a dialog box opens informing the user that this operation is not possible.

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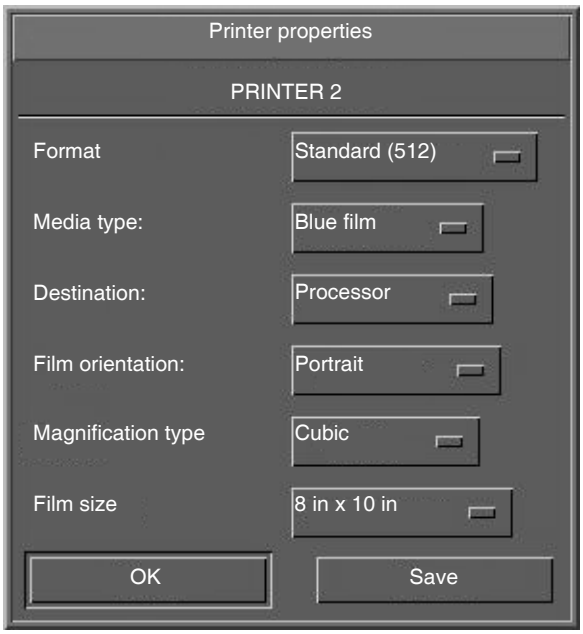
3-3 Printer properties



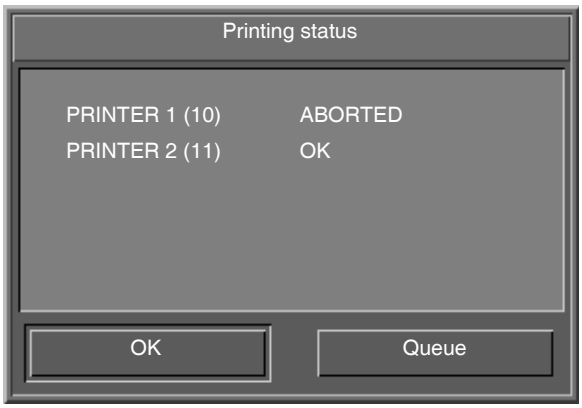
This window is accessed from either the *Auto Print* window, the *Print Request* window, or the Scrapbook Print Manager panel. It displays the properties set for the selected printer.

- *Format* and *Magnification type* cannot be changed with the current Senographe Essential release software.
- *Media type*: *Blue film* must be selected by default with Senographe Essential. Other choices will cause printing errors.
- *Destination*: *Processor* must be selected by default when using Senographe Essential. Other choices will incur printing errors.
- *Film orientation*: *Portrait* must be selected by default when using Senographe Essential. Other choices will incur printing errors.

Note:

The user does not need to change any value here to set the *Auto Print* function. Film size value indicated in **Printer properties** panel is the film size used for the last printing, which may have been an auto-print or a manual print. If Auto Print is set to ON, at exam closure, the film size value that will be considered for the Auto Print is the one of Auto Print tab. The film size value of Printer Properties panel will be erased and replaced by the film size value set in Auto Print tab.

3-4 Printing status



The *Printing status* window displays the status of the requested printing jobs.

- If a job shows the *OK* comment, the exam has successfully been sent to printing. If the job shows the *ABORTED* comment, the job has been aborted manually by the Operator from the menu window buttons.
- Click the *Queue* button to open the *Filming Queue* window (see section *3-5 Filming queue on page 200*).

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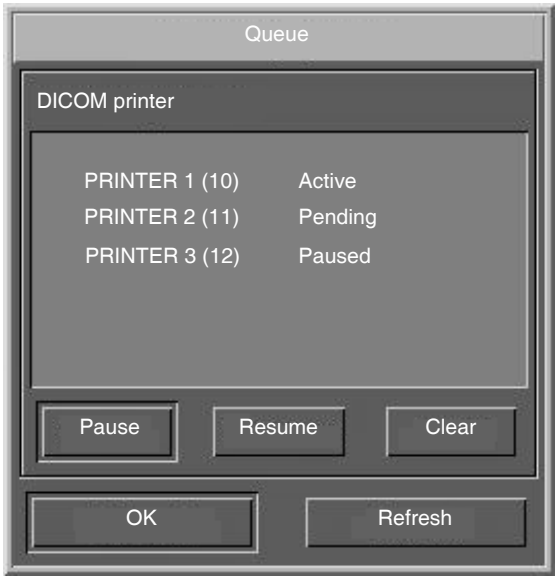
3-5 Filming queue

This window is accessed by clicking the ***Queue*** button in the *Print Request* window or the *Printing status* window.

It displays a list of jobs in the print queue, allowing the Operator to check that print jobs have been successfully sent to the printer. Note that a local printer problem can prevent a job from being printed, even if it is successfully sent to the printer. If any communication problems are observed with the printer or network, the Operator is able to *Refresh*, *Pause*, *Resume*, or *Clear* jobs listed in the Queue.



3-6 Print annotation models

When printing images to film, four models of annotation layout are available. They differ in the position and type of annotation information to be printed. See section *3-2 Annotation Level on page 174* in Chapter 21 *Viewer*.

Note:

Only the annotation models shown below as Model 3 and Model 4 contain the information required by the Quality Mammography Standards of the MQSA. Only Model 3 and Model 4 position the patient, institution, operator, and exposure data in a film footer or margin to avoid overlap of the annotations with the image.

Select the model to be used in the *Medical Application preferences Annotations* panel (see Chapter 18 *Browser*).

The illustrations below show the four models. In each case the model is illustrated by a view with the chest wall to the right.

Note:

Image size and FOV size are symbolized by [ ] and #, respectively. Image processing displayed (PROC_0, PROC_1, etc.) is described in section *3-1 Annotation Content on page 172* in Chapter 21 *Viewer*.)

3-6-1 FB view exception

On the AWS, the View and Laterality indication is placed in the lower part of the monitor.

Most images of the breast are presented with the axillary region in the upper part of the monitor. The **FB** (**F**rom **B**elow) views are presented in deviation to this practice and have the axillary region in the lower part of the monitor.

As a result of a software enhancement that provides consistency among all views in images printed to film, the axillary region of FB views is now placed near the upper part of the film. To indicate that an FB view film printout has the benefit of this enhancement, its laterality annotation (*L* or *R*) is printed in *italics*.

- For detailed information about FB view exception, see section *1-1-1 FB view exception on page 166*.

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Print annotation Model 1:

Model 1:

Institution, physician, Operator, and patient data at top, followed by view data.

Image and exposure data at bottom.

Top and bottom annotation areas are aligned to the border opposite the chest wall.

This model does NOT contain all of the information required by the Mammography Quality Standards Act (MQSA).

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Print annotation Model 2:

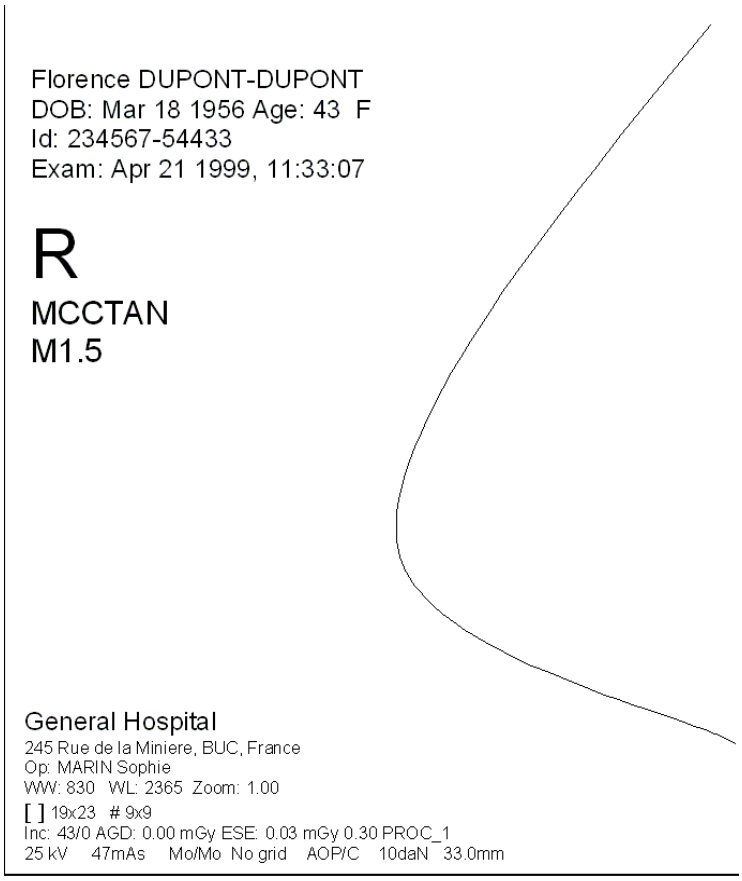
Model 2:

Patient data at top, followed by view data.

Institution, Operator, image and exposure data at bottom.

Top and bottom annotation areas are aligned to the border opposite the chest wall.

This model does NOT contain all of the information required by the Mammography Quality Standards Act (MQSA).


Florence DUPONT-DUPONT
DOB: Mar 18 1956 Age: 43 F
Id: 234567-54433
Exam: Apr 21 1999, 11:33:07
R
MCCTAN
M1.5
General Hospital
245 Rue de la Miniere, BUC, France
Op: MARIN Sophie
WW: 830 WL: 2365 Zoom: 1.00
[ ] 19x23 # 9x9
Inc: 43/0 AGD: 0.00 mGy ESE: 0.03 mGy 0.30 PROC_1
25 kV 47mAs Mo/Mo No grid AOP/C 10daN 33.0mm

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Print annotation Model 3:

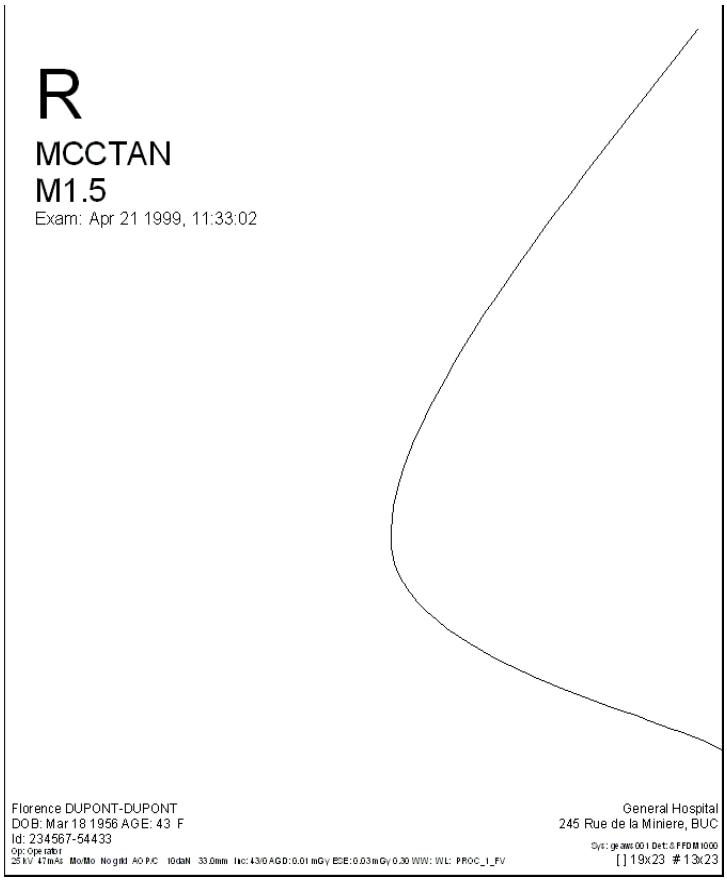
Model 3:

View data at top, followed by exposure date and time.

Patient data at bottom left, image data at bottom middle, institution and Operator data at bottom right, followed by exposure data.

The top annotation area is aligned to the border opposite the chest wall. All bottom annotations are restricted to the image footer so as to avoid overlap with the image.

This model contains the information required by the Mammography Quality Standards Act (MQSA).



CAUTION

Large (24 x 31) images printed using Print annotation Model 3 shall not be used for final interpretation.

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Print annotation Model 4 for 19 x 23 (8" x 10") film:

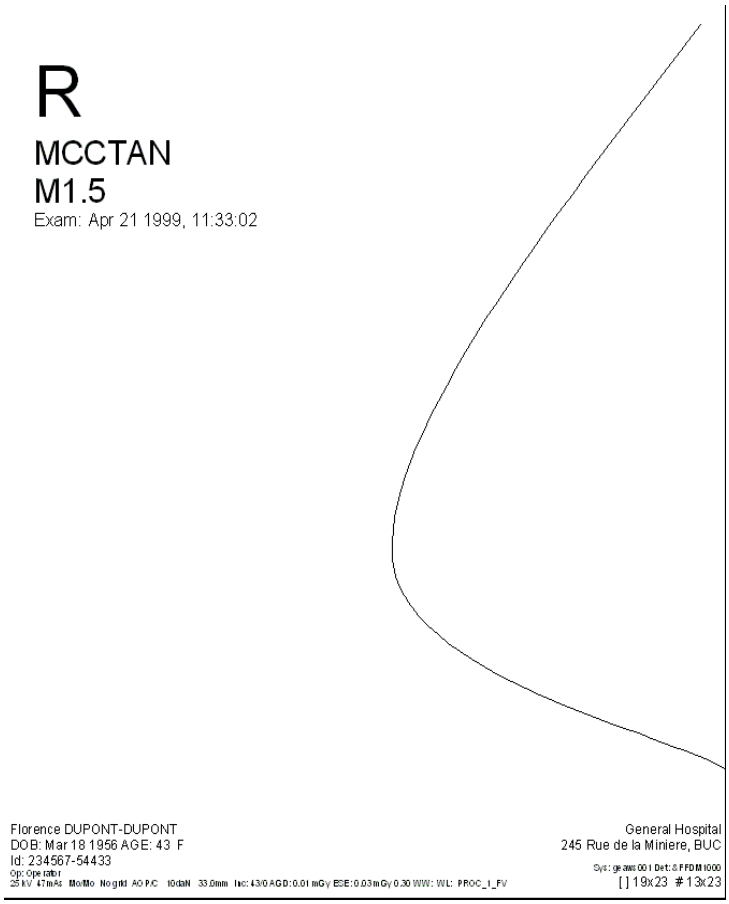
Model 4 for 19 x 23 (8" x 10") film:

View data at top, followed by exposure date and time.

Patient data at bottom left, image data at bottom middle, institution and Operator data at bottom right, followed by exposure data.

The top annotation area is aligned to the border opposite the chest wall. All bottom annotations are restricted to the image footer so as to avoid overlap with the image.

This model contains the information required by the Mammography Quality Standards Act (MQSA).



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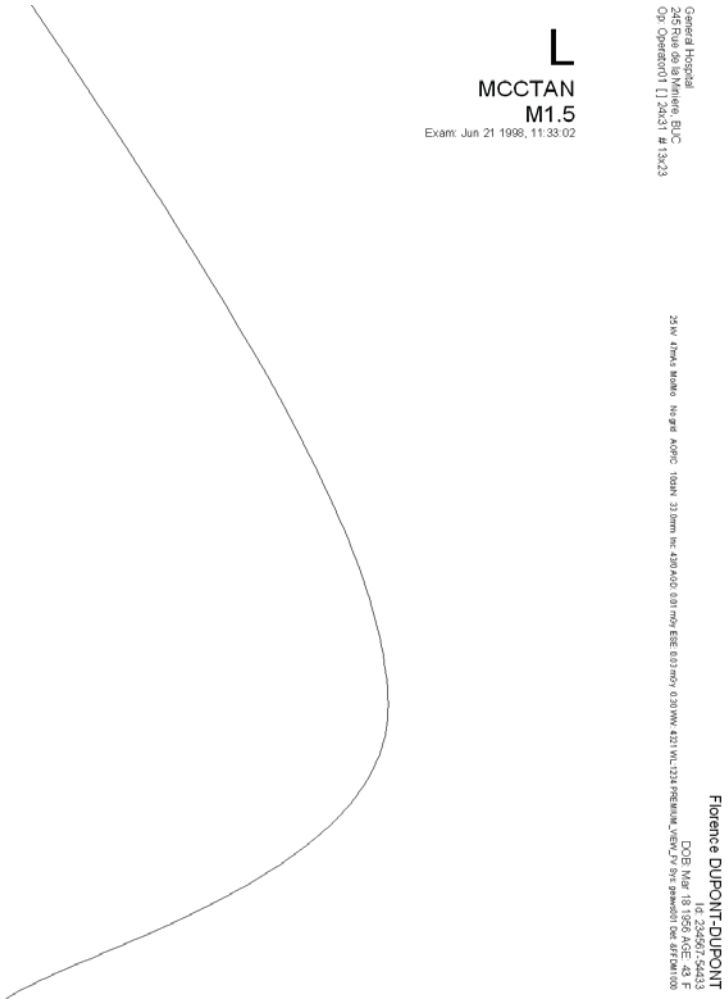
Print annotation Model 4 for 24 x 31 (10" x 12") - film (view with chest wall to the **left**):



Model 4 for 24 x 31 (10" x 12") film

View data at top, followed by exposure date and time.

Patient, image, institution, Operator, and exposure data are printed vertically opposite the chest wall side of the film.

The top annotation area is aligned to the border opposite the chest wall. All vertically printed annotations are restricted to an area outside the image so as to avoid overlap with breast tissue.

This model contains the information required by the Mammography Quality Standards Act (MQSA).

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Print annotation Model 4 for 24 x 31 (10" x 12") - film (view with chest wall to the right):

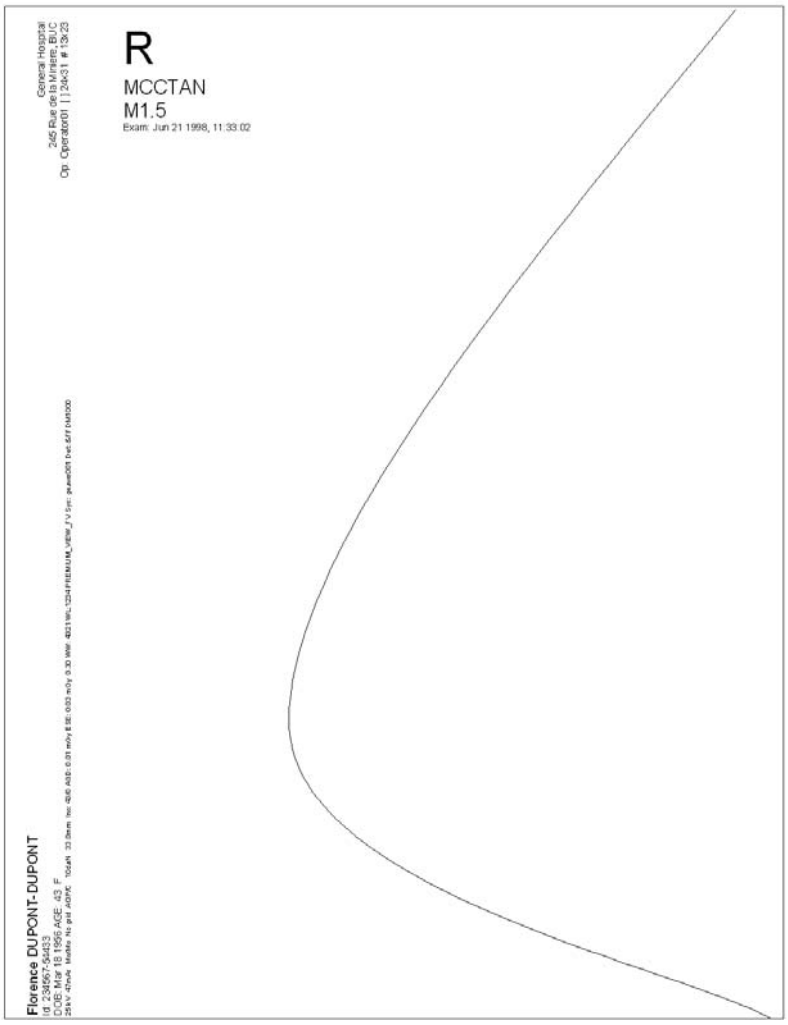
Model 4 for 24 x 31 (10" x 12") film

View data at top, followed by exposure date and time.

Patient, image, institution, Operator, and exposure data are printed vertically opposite the chest wall side of the film.

The top annotation area is aligned to the border opposite the chest wall. All vertically printed annotations are restricted to an area outside the image so as to avoid overlap with breast tissue.

This model contains the information required by the Mammography Quality Standards Act (MQSA).



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Chapter 24 Interchange media

1 Overview

The interchange media function provides a compact disk recording (CD-R) drive, installed inside the Control Station (see illustrations below).

Illustration 1 Access to CD Drive FOR more recent systems

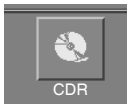
Access to CD reader/recorder drive.
For interchange media usage by the Operator Referred to as CD-R or CDR elsewhere in this manual.
Also used by service.

The interchange media function allows you to save and restore Senographe Essential image data using standard or mini recordable compact disks (DICOM data format). Images saved in this way may, for example, be passed to another radiologist for a second opinion.

CAUTION

The interchange media function is NOT recommended for permanent archiving.
GE Healthcare does not guarantee the suitability of the media for such purposes.

The presence of the CD-R function is indicated by an icon in the Network panel of the Browser window (upper left corner).



- An icon appears below each of the lists in the Browser. These icons may be turned off and on in the *Browser preferences* window, accessed through the *Tools menu*, see Chapter 18 *Browser*.

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2 Using the interchange media

Recordable CDs are considerably more sensitive to damage than the conventional CD-ROMs that you may be familiar with. Respect the handling instructions below.

2-1 Handling recordable CD media

! Notice:

To avoid image loss, never touch the recordable surface of a recordable CD (CD-R). Handle the disk only by the outer edge. Do not place it face down on a hard surface. Fingerprints or scratches will make the disk unusable.

Before usage, verify that the CD-R surface has no visible scratches. If there are any scratches, do NOT use the CD-R.

- Store the CD-R in its protective case. Proper storage helps protect the data from damage due to scratches on the CD-R surface.
- Do not leave the CD-R in direct sunlight or in a hot, humid environment. These conditions can warp and damage the disk.
- Use only a felt tip permanent pen when labeling. Write only on the printed area or on the clear inner diameter of the disk. Never use a ballpoint or hard point writing tool as it may damage the disk. Do not use adhesive labels.
- Use a soft, lint-free cloth to remove spots, dust, or fingerprints from the disk. Always wipe from the center to the outside edge of the disk. Never wipe the disk in a circular motion.
- Do not use any chemical-based cleaners. These can damage the disk.

2-2 Saving images on recordable CD

Note:

GE Healthcare recommend the use of Senographe Essential-compatible CD-R media that have been officially validated for performance and reliability of patient data interchange on the Senographe Essential system. These are identified by GE Healthcare labelling. GE Healthcare cannot take responsibility for any data loss or incompatibility with other systems resulting from the use of media not supported by Senographe Essential.

To order Senographe Essential-compatible media, contact your GE Healthcare local sales Representative.

- A recordable CD (CD-R) can only be recorded once.
- When saving image data on a CD-R, you must always use a blank CD-R.

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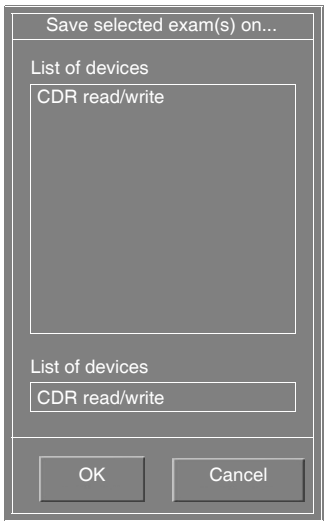
2-2-1 Procedure

All image data that you want to save on a given CD-R must be selected beforehand, and will be saved in a single pass. It is not possible to add data on a CD-R.

- Push the eject button under the tray on the CD-R drive. When the tray opens insert a new (blank) recordable CD into the CD-R drive (see section *2-1 Handling recordable CD media on page 208* on how to handle recordable CDs) and close the drive by pushing the button again. Wait for 40 seconds for the CD-R drive to be ready (when the light on CD-R drive stops blinking).
- On the Browser, select the patient or patients to be saved in the same manner as selecting images for review (click the required patient name in the Browser list; to select multiple patients, hold down the <Control> key and click successively on each required patient name).
- Use the middle mouse button to drag the selected patient(s) to the CD-R icon in the Network panel,
  Or:

- Click the *Push* button below the patient list on the Browser (if the icon is not present, it may be turned on by accessing Browser preferences from the *Tools menu*). A window opens to show a list of available recording devices.

- Select the CD-R read/write device by clicking on its name in the displayed list, then click the ***OK*** button. If the Preview of CD-R content has been set (see *2-2-2 Preview option on page 210*) a list of data to be recorded on the CD-R appears.
  After about 15 minutes a message appears, indicating how much of the CD-R capacity will be used.
- Click the *Write* button to start the operation, or on the *Cancel* button to cancel it.



Note:

While selecting items (before you start the save), the operation can be abandoned by clicking on the CD-R icon and selecting **Detach** in the drop-down menu. This stops the operation. The CD is ejected automatically and can be used again.

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2-2-2 Preview option

After clicking on the *OK* button or after using “drag-and-drop” to start recording, but ***before*** saving starts, the *Preview of CD-R content* automatically displays a list of the patients which will fit on the CD-R, and the estimated time required. Note that the list may not be in the order selected by the Operator, and that it cannot be assumed that all patients selected for recording will fit.

At this stage, you can still cancel the save operation and modify your selection if required.

- To set this option on or off, click the **CDR** icon in the Network/Archive panel on the main Browser and select **Option** in the drop-down menu.

2-2-3 Checking the CD-R

You are recommended to check for successful completion by browsing the CD-R at the end of the save operation.

- To do so, click the *CDR* icon on the main Browser, then select **Query** in the drop-down menu. If all the patients selected for the save operation are not displayed on the *Media Browser* an error has occurred while recording the CD, and you will have to repeat the save operation.
- An error message appears next to the patient name if the associated information has not been saved. If this occurs:
  - Make a list of the patients correctly saved and those with an error.
  - Insert a new CD-R and repeat the save process.
  - If there are still errors, consult your GE Healthcare Service Representative.

2-2-4 System not available while writing to CD-R

No other operation can be performed on the system while saving images on a CD-R. For a full CD-R the save operation can take up to 25 minutes. Burning of CD-Rs could therefore be done before or after patient imaging or be pushed to a review workstation and burned from the review workstation.

2-2-5 Errors

If a problem occurs, an error message appears:

- The following message may appear during preparation for saving files; it needs specific action:
  Save selection exceeds CD capacity. Save aborted.
  Explanation: You have selected more patient files than can be stored on a single CD-R.
  Action: Select fewer patients or fewer exams to be saved on the CD-R.
- If a problem occurs during the save process, the error message *Save failed* appears.
  First check that the blank recordable CD is correctly inserted in the CD-R tray, and the tray is fully closed.
  If the items above are correct, an error has occurred while recording the CD, and you will have to repeat the save operation using a new blank CD.

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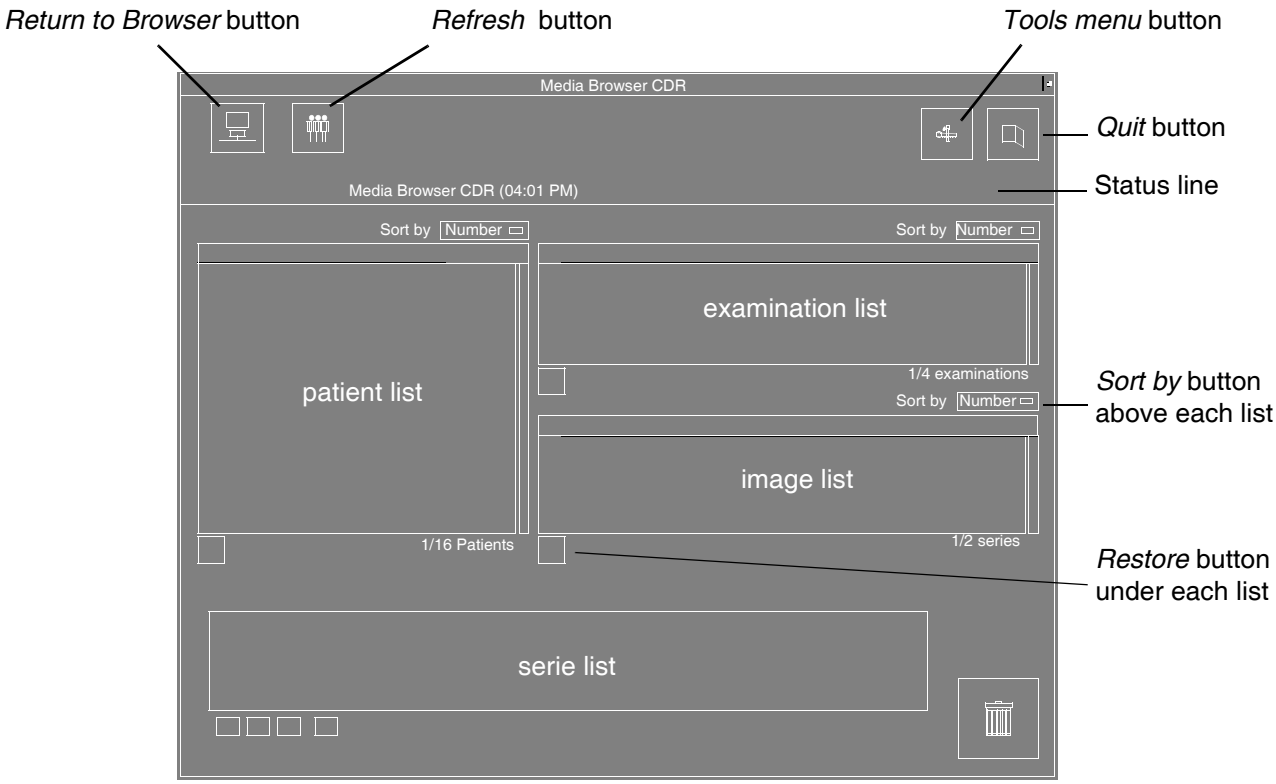
2-3 Restoring images from recordable CD

You can restore and review Senographe Essential images from recordable CDs that were recorded either on the same or on another Senographe system.

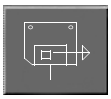
2-3-1 Procedure

- Check that there is enough space on the AWS disk system to accommodate the images being restored (refer to the used disk space display on the main Browser).
- Insert the CD containing the images into the CD-R drive (see section *2-1 Handling recordable CD media on page 208* for handling precautions).
- Click the ***CDR*** icon in the Network panel on the main Browser and select Query in the drop-down menu to open the Media Browser.



- In the *Media Browser* window, select the patient(s) and/or exam(s) to be restored in the same manner as on the main Browser (see Chapter 18 *Browser*).
- Sort the lists as required using the ***Sort by*** buttons.
- After selecting the desired patient, exam, series or image item(s):
  - With the cursor on the selection, press and hold the *middle* mouse button and drag the selection directly onto the *Return to Browser* button at top left.

  Or
  - Click the corresponding *Restore* button (if the icon is not present, it may be turned on by accessing Browser preferences from the *Tools menu*).



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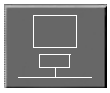
The selected items are copied from the CD-R to the AWS database.



- Click the ***Return to Browser*** button to return to the main Browser.
- See section *2-4 Ejecting a disk from the CD-R drive on page 212* on how to eject the CD-R from the CD-R drive after the restore operation.

Note:

During the restore, no other operations are possible on the AWS.
When a patient name already exists in the AWS database, any exams being restored from the CD for that patient are appended to the existing exams.

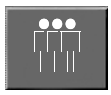
2-3-2 Errors

- When restoring files, the operation is halted if there is not enough space on the AWS disk system to restore the selected items (patients or exams).

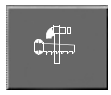
  You can repeat the operation after freeing AWS disk system space by deleting some patients that have already been saved.

2-3-3 Notes

- The contents of the Media Browser are up-to-date when the Media Browser is first opened. However, changes (such as after a save operation) are not displayed automatically. Click the *Refresh* button to update the Browser lists. The time of the latest refresh appears on the status line.



- The *Media Browser Tools menu* contains the *Application Management* menu item. This item is for use of GE Healthcare service only.



- The Main Browser and Media Browser display the same columns of information in the Patients, examinations, series and images lists. However, some of these columns may be empty in the Media Browser. The full information will be displayed in the Main Browser after the images have been restored.

2-4 Ejecting a disk from the CD-R drive

As soon as the CD-R drive has been accessed for a save or restore operation, it is locked, and you can no longer eject the disk by means of the eject button on the front of the drive.

You must first perform a *Detach* operation:

- Click the *storage device* icon in the Main Browser and select Detach in the drop-down menu.
- If the disk is not ejected automatically, press the eject button.
- If *Detach* appears in grey and no save or restore operation is in progress, the archive device is already unlocked. Press the eject button to open the drive.

If a fault occurs (for example trying to start a restore operation with a blank disk in the drive), the *Detach* operation is performed automatically, and the disk is ejected.

! Notice:

Never press the eject button on the CD-R drive while a save or restore operation is in progress.

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Chapter 25 2D Localization examination

The 2D Cross-hair option is provided for use with the Senographe Essential System. It includes a 2D Cross-hair device and 2D localization paddles, intended to be used together with the face shield.

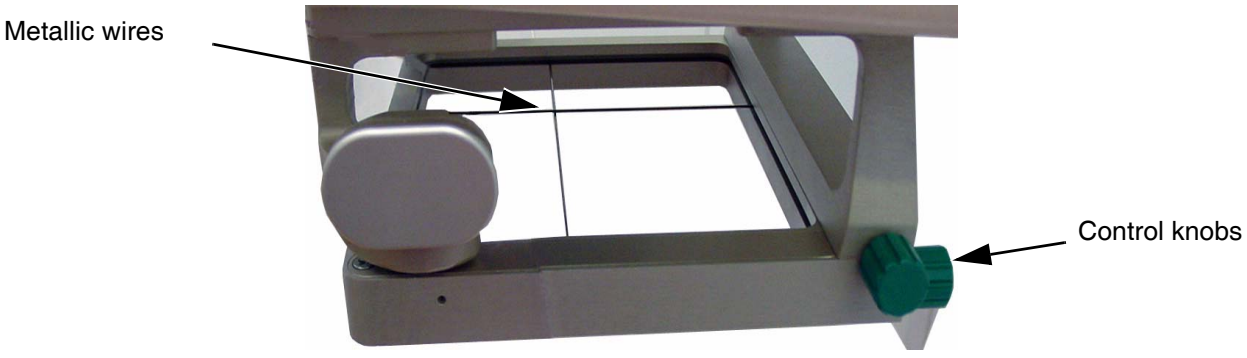
1 Face shield and 2D Cross-hair device

1-1 Description

Face shield

Face shield with 2D Cross-hair device

- The face shield is used to keep the patient's face, hair, ear lobes, etc. out of the X-ray beam during exposure.
- The 2D Cross-hair device includes metallic wires which may be positioned in the field of view as required. It is used during manual biopsy procedures, to target a position for the introduction of a needle or to position a marker for a tangential view. Manual control knobs allow the wires to be moved on the X and Y axes.



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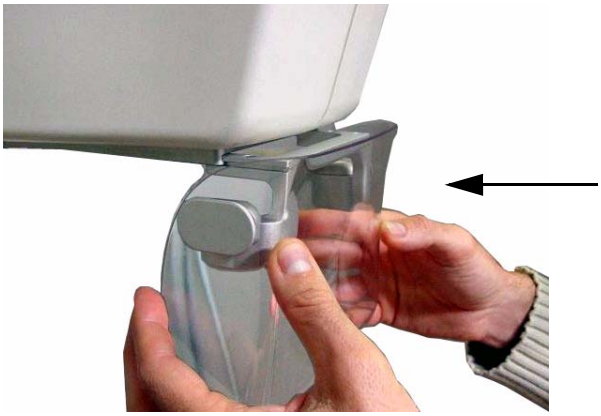
1-2 Mounting instructions

The face shield and 2D Cross-hair device can be easily mounted and removed as required.

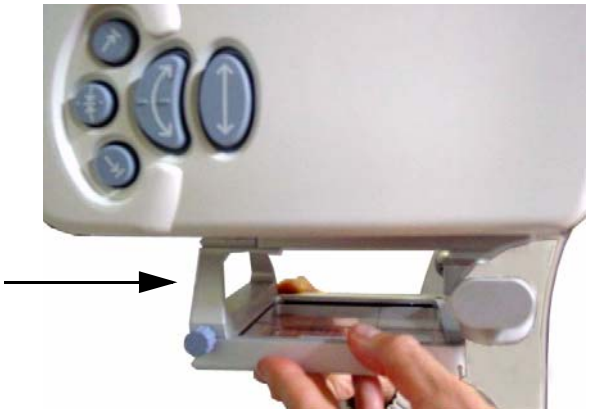
- The face shield is mounted by sliding it into the front interface plate rails, from the front of the X-ray tube head.

  Face shield insertion:



- The 2D Cross-hair device is mounted by sliding it into the rear interface plate rails, from the rear of the X-ray tube head.

  2D Cross-hair device insertion:



CAUTION

The Face shield and the 2D Cross-hair device must be removed before installing the Magnification stand.

The face shield must always be mounted from the front, never from the rear. The rear rails are intended for mounting the 2D Cross-hair device only.

Make sure that the face shield and the 2D Cross-hair device are pushed all the way onto the rails: you must hear a click and feel a mechanical stop.

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2 2D Localization examination procedures

2-1 Safety recommendations

CAUTION

Elevation and rotation movements are enabled when the displayed compression force is less than 3 daN. Where possible, make sure the compression force is higher than 3 daN before starting the biopsy. If compression less than 3 daN must be used (e.g., if the patient has a sore breast or an implant), great care must be taken to avoid unwanted Gantry movements, and AOP cannot be used.

CAUTION

Ensure that the footswitches are placed so that the patient cannot reach them and release the compression during positioning or imaging.

CAUTION

If the patient moves during the biopsy procedure or compression thickness changes, the procedure should be started again from the beginning in order to guarantee the accuracy of the biopsy.

2-2 Preparation

- Insert the face-shield and the 2D Cross-hair device (see section *1-2 Mounting instructions on page 214*). Use the X and Y manual control knobs as necessary to be sure that the cross wires are positioned out of the field of view.
- Insert a biopsy paddle (2D large localization paddle or 2D spot localization paddle):

2D large localization paddle

2D spot localization paddle

- The biopsy procedure can be performed at all angles, but the angle used must be chosen to provide the shortest possible distance for the needle from the skin to the lesion.
- For views that do not require the patient to stand, the patient must be seated in a biopsy chair; the chair must provide good support to the patient's back and arms. An optional biopsy chair is available from GE Healthcare.
- It is suggested to turn off the *Auto Push* and *Auto Print* features in *Medical Application preferences.*
- At the control console, turn off Auto decompression (menu *Medical/DECOMP/DECOMP/NO*).
- Compress the patient's breast. Make sure that the region of interest (target or suspicious area) is located in the center of the graduated window of the biopsy paddle.

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2-3 Definitions

Physical and electronic Cross-hairs:

The X-ray image of this crossed wires superposed on the Breast image will be named "physical Cross- hairs" in the rest of this chapter, to distinguish it from the "electronic Cross-hairs" that can be displayed on the image on the monitor, as explained in section *2-3 2D Loc. - electronic Cross-hairs on page 170*.

Physical Cross-hairs images:

X-ray image: making an exposure.

Light image: turning on the Collimator light.

Target:

Target is the object in the breast which is to be sampled with a needdle.

Insertion point:

Entry point for the needle on the skin of the breast.

Image target:

X-ray image of the target.

2-4 Acquisition procedure

- Make sure that the patient's head is out of the light field.
- Acquire an image. See section *5 Examination: acquire the 1st image on page 74*.
- Leave the breast under compression.
- In the Viewer, click the *2D Loc.* icon to display a set of electronic cross hairs on the monitor image. This icon is enabled in acquisition mode only.
- Use the trackball or mouse to position the intersection of the electronic Cross-hairs over the center of the target (see the instructions given in section *2-3 2D Loc. - electronic Cross-hairs on page 170*).
- On the monitor, read the relative position of the graduations on the biopsy paddle (X and Y axes). Use *Zoom 1*, *Zoom 1/2* or *Fit to Screen* as required for the best visualization of the area. If the graduations can not be seen in the zoomed view after the electronic cross hairs have been positioned, reduce the zoom to display the graduations.
- Use the knobs on the 2D Cross-hair device to move the wires into the correct alphanumeric position. The goal is to superpose the image of the physical Cross-hairs with the electronic Cross-hair.
- If needed, perform another acquisition to verify the correct position of the physical Cross-hair.
- To insert the needle, first anesthetize the insertion point if required. Turn on the Collimator light, then place the needle tip at the intersection of the shadow of the cross wires at skin level and insert the needle.
- With the needle in place, make sure that the shadow of the cross wires coincides with the hub of the needle.
- Use the knobs on the 2D Cross-hair device to move the cross wires out of the field of view.
- Perform another acquisition to verify correct needle position.
- Use the manual compression knobs to decompress slowly and carefully.
- Remove the fenestrated biopsy paddle and install a non-biopsy paddle.
- Support the breast and turn the Arm through 90 degrees.

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- Perform another acquisition to check for correct depth.
- When the correct needle depth or hook wire position is obtained, release the patient.

2-5 Completion

- The images can now be annotated and/or measurements can be applied.
- Click the print icon to print each required image.
- Push the images to the Seno Advantage Workstation.
- In *Medical Application preferences*, turn *Auto Push* and *Auto Print* on or off as required.
- At the control console, turn *Auto decompression* back on for routine mammography.

3 Cleaning and disinfection

- Refer to the instructions for *Cleaning and Disinfection* given in the section *Recommended planned maintenance procedures must be performed as specified by Field Service Representatives, the Radiologic Technologist, and by the Medical Physicist. on page 271* of Chapter 28 *Planned Maintenance*.

! Notice:

Always follow the product manufacturer's instructions and precautions for cleaning and disinfection.

To apply LpHse cleaning solution, use a cloth, sponge or mop saturated with solution. Allow surface to remain wet for 10 minutes.

Do not immerse the 2D Cross-hair device or face shield in a solution or other liquid.

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Chapter 26 Operator messages

1 Introduction

Any operational anomalies found by the system during Senographe Essential operation are signalled by *Operator Messages*. These may be displayed on the X-ray Console, in a pop-up window on the AWS LCD monitor, or on the Gantry readout. They may be simple information messages requiring no action, or they may indicate error or fault conditions requiring action from the Operator and/or Field Service Representatives.

If you need to call your Field Service Representative about an Operator message, you should quote the entire message or messages, complete with any identification characters.

The following tables list Operator messages which may occur, with explanations and recommended actions.

- Table *1 Operator messages displayed on the X-ray Console on page 220*
- Table *2 Operator messages displayed on the AWS LCD monitor on page 233*
- Table *3 Messages regarding breast supports on page 237*
- Table *4 Messages regarding FOV on the Gantry readout on page 241*
- Table *5 Error messages on the Gantry readout on page 243*

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2 Operator messages displayed on the X-ray Console

- These messages begin with a three-character identification code, followed by the message itself. The first letter of each code indicates the type of message, as follows:
  - *Exx*: *Error messages* indicating that a non-recoverable error has been detected. The system must be restarted by switching OFF/ON from the X-ray Console.
  - *Ixx*: *Information* or *warning messages* indicating operational errors due to temporary fault conditions or attempts to use non-permitted configurations. It is usually possible to continue use of the system without reboot.
  - *Sxx*. *System exposure messages* indicating conditions in which an exposure may not be possible or has not been correctly terminated.

Table 1 Operator messages displayed on the X-ray Console

Messages on X-ray Console	Explanation	Corrective Action
E01 Generator failure	Problem reported in HV section of generator.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E02 Focus bias failure	Problem reported in tube focus bias circuits.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E03 Rotor failure	Problem reported in anode starter.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E04 Arm fatal failure	Generator detected an error in communication with the Arm.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E05 Failure during exposure	Current exposure aborted due to failure in equipment.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and inform your Field Service Representative.
E06 Software error (gen CPU)	An error occurred in the Generator CPU software.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and inform your Field Service Representative.
E07 Please TURN OFF the console!	A generator emergency failure occurred but a second failure prevented the system from shutting itself down.	1. Note ALL messages. 2. Switch OFF the system from the X-ray Console to quickly switch off the generator. 3. Contact your Field Service Representative.
E08 Power supply failure	Supply of generator power circuits is not authorized.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E10 Heating failure track 1	Molybdenum focal track is unserviceable.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative. You can still work with the rhodium focal track.

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Messages on X-ray Console	Explanation	Corrective Action
E11 Heating failure track 2	Rhodium focal track is unserviceable.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative. You can still work with molybdenum focal track.
E12 Checksum error (gen)	Calibration parameters have been modified.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E13 Gen./Arm communication fail	Generator cannot communicate with the Arm.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E14 Generator CPU/ INTG failure	A problem has been reported by the Generator CPU.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E15 Console communication fail	Generator cannot communicate with the X-ray Console.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E18 IDC/SENO Synchro. fail	A problem occurred in synchronization between Image Detection Controller system and Generator during acquisition. The image may be fully acquired, but dose parameters will be missed (set to 0 in the image). Next exposure is inhibited.	1. Power OFF/ON from the X-ray Console. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
E19 IDC/SENO down, DPS is OFF	Image Detection Controller system cannot communicate with Generator. The Detector Power Supply has been powered OFF by the system.	1. Power OFF/ON from the X-ray Console. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
E20 Check Main Distribution Rack	Supply of Control Station and Detector environment circuits is not authorized.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and inform your Field Service Representative.
E21 Detector supply not supplied	Supply of Detector circuits is not authorized.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and inform your Field Service Representative.
E22 Conditioner not supplied	Supply of detector Conditioner circuits is not authorized.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and inform your Field Service Representative.
E23 AWS cart not supplied	Supply of Control Station circuits is not authorized.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and inform your Field Service Representative.

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Messages on X-ray Console	Explanation	Corrective Action
E24 Failure before exposure	Current image acquisition aborted before exposure due to failure in the equipment	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
E25 AWS/SENO Synchro. fail	A synchronization problem occurred between AWS system and Generator during acquisition. Next exposure is inhibited.	1. Switch OFF the whole system and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
E26 AWS/SENO comm. failure	AWS system cannot communicate with Generator.	1. Power OFF/ON from the X-ray Console. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
E35 SYSTEM SHUTDOWN STARTED	A complete system power OFF has been started. The Generator will power off supplies to the Detector, Gantry and Generator in a few minutes.	Stop system usage and wait for the end of the shutdown sequence.
E36 CART PWR FAILURE - SHUTDOWN	A system shutdown has been started because an UPS error has been detected or communication with UPS has been lost.	1. Stop system usage and wait for the end of the shutdown sequence. 2. Check the mains power supply. 3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system until the batteries have recharged. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
I05 Exposure abort by mAs level	Exposure aborted because not enough mAs available to continue exposure.	1. Press the Exposure Interrupt button. 2. Reposition the patient. 3. Start exam again. 4. If the problem continues, note ALL messages and contact your Field Service Representative. 5. Nevertheless, you can continue to use the system with manual acquisition.
I06 Abort: Detect sig. out range	Exposure aborted because brightness received by detector is not in range to continue exposure.	1. Press the Exposure Interrupt button. 2. Reposition the patient. 3. Start acquisition again. 4. If the problem continues, note ALL messages and contact your Field Service Representative. 5. Nevertheless, you can continue to use the system with manual acquisition.
I07 Selected filter not allowed : Al	Filter selected by the Operator not allowed. The Senographe automatically selects the next correct filter.	Press "Filter selection" to select the correct filter.

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Messages on X-ray Console	Explanation	Corrective Action
I12 Maximum mAs = xxx	Maximum available mAs are equal to xxx.	Information message only. (If mAs exceeded, the exposure is aborted at 2 or 3 mAs if entire exposure cannot be made.)
I13 IDC was not ready	Image Detection Control system was not ready to perform an image acquisition.	1. Press the prep button again. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
I14 AWS was not ready	AWS system was not ready to perform an image acquisition.	1. Press the prep button again. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
I15 Console locked	The X-ray Console is locked due to service access (detector calibration or IQ tool is in progress). Actions on right-hand section of X-ray Console are still available.	Wait until end of service access. If no service in progress, power OFF/ON from the X-ray Console.
I16 Collimator locked	The diaphragm control is locked because a detector calibration is in progress.	Wait until end of the calibration. If no calibration in progress, power OFF/ON from the X-ray Console.
I17 AWS/SENO comm. lost	AWS system cannot communicate with Generator. A service laptop may be connected in place of the AWS, or the AWS may be powered OFF for service requirements.	1. Wait for completion of the service operation if there is one, or wait one minute to allow the system to recover. 2. If the problem persists, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
I18 Collimator/Console locked	The X-ray Console and the diaphragm control are locked due to service access (detector calibration in progress). Actions on right-hand section of X-ray Console are still available.	Wait until end of service access. If no service in progress power OFF/ON from the X-ray Console.

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Messages on X-ray Console	Explanation	Corrective Action
I19 IDC/SENO comm. lost	The Image Detection Controller system cannot communicate with the Generator. If communication is not recovered in a few minutes, the system will be in failure mode (error E19).	Wait until the Image Detection Controller system recovers.
I21 Heating failure track 1	Molybdenum focal track is out of use.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative. You can continue using rhodium focal track.
I22 Heating failure track 2	Rhodium focal track is out of use.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative. You can continue using molybdenum focal track.
I23 Console communication fail	Generator-X-ray Console connection is faulty.	Power OFF/ON from the X-ray Console. If problem continues, note ALL messages and contact your Field Service Representative.
I24 Line power interruption	Micro power cut occurred on line supply.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
I25 Recumbent patient view names	Operator has selected a View name for recumbent patient.	If you do not want to make the acquisition with the selected View name, enter and leave the set-up/ View menu without pressing Valid, to return to normal View name selection. The View name selection will return to normal selection after the next exposure.
I27 Generator CPU battery error	CPU backup battery is discharged.	Contact your Field Service Representative. DO NOT REMOVE POWER FROM EQUIPMENT.
I28 Max wait for same exposure mn	It is necessary to wait the displayed time to be able to repeat the same exposure.	Wait the required amount of time to repeat exposure. If an exposure is attempted before this time, an abort may possibly occur (there is a safety margin to ensure proper operation). You can ignore the message if a different, less dense, breast is to be imaged next.
I29 Excessive mAs for this mode mAs	The amount of mAs necessary to repeat the same exposure is too high in the mode selected.	Switch to a different mode or to a different filter.

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Messages on X-ray Console	Explanation	Corrective Action
I31 AOP abort: use manual mode	This error indicates that the average signal level of the pre-exposure image is too low to calculate the X-ray parameters for the exposure.	Switch to manual mode, or ensure that conditions are correct for use of AOP. - Do not use AOP if the breast thickness exceeds 9 cm (3.5 inches). - Ensure that no highly attenuating objects (markers larger than 2 mm^2, needles, etc.) are inside the AOP sensing zone - Ensure that the Collimator blades are outside the FOV. - Ensure that the compression force and thickness measurements are correctly calibrated. - Do not use AOP with a breast containing an implant. If the problem recurs frequently after taking the above precautions, note ALL messages and inform your Field Service Representative.
I32 AOP abort: use manual mode	This error indicates that the average signal level of the pre-exposure image is too high to calculate the X-ray parameters for the exposure.	Switch to manual mode, or ensure that conditions are correct for use of AOP. - Ensure that the breast extends into the AOP sensing zone. - Verify that the breast thickness is shown as greater than 0 cm on the Gantry readout. If the problem recurs frequently after taking the above precautions, note ALL messages and inform your Field Service Representative.
I33 Abort: No AOP zone found	This error indicates that no glandular region was found.	- Do not use AOP if the breast thickness exceeds 9 cm (3.5 inches). - Verify that the breast thickness is shown as greater than 0 cm on the Gantry readout. - Ensure that the breast extends into the AOP sensing zone. - Ensure that no highly attenuating objects (markers larger than 2 mm^2, needles, etc.) are inside that AOP sensing zone. - Ensure that the compression force and thickness measurements are correctly calibrated.
I34 Thickness out of AOP range	This error indicates that AOP Image Quality can not be ensured, because the breast thickness is outside the AOP thickness range of 0 cm - 9 cm (0 to 3.5 inches).	- Do not use AOP if the breast thickness exceeds 9 cm (3.5 inches). - Verify that the breast thickness is shown as greater than 0 cm on the Gantry readout. - Ensure that the breast extends into the AOP sensing zone. - If the breast is too thick, or it can not be positioned in the AOP sensing zone, use manual exposure control.
I46 System Setting in progress	AWS set-up in progress (loading of Flat Field map) after a new filter was selected.	No action required. This message appears for two seconds after selection of a new filter.

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Messages on X-ray Console	Explanation	Corrective Action
I50 Lock Jammed	The system is in degraded mode: Gantry device configuration is not a standard configuration. The system functionality is not optimum.	1. If the installed paddle is not a Senographe Essential paddle: A. Remove it. B. Install a Senographe Essential paddle. 2. If the installed paddle is a Senographe Essential paddle: A. Remove it and reinstall it. B. If the warning persists, check with another Senographe Essential paddle. B1. If the warning disappears with another Senographe Essential paddle, the paddle that generated the warning is not recognized by the system; the thickness/force measurements with this paddle are not accurate. B2. If the warning persists with another Senographe Essential paddle, the thickness/force measurement with all paddles are not accurate.
I51 Lock Overheated	The system is in degraded mode. The X-ray tube head fan has failed. As a result, tube cooling is not effective and the tube thermal algorithm could not prevent exposure abort due to tube overheating.	1. The system can continue to be used but please reduce the cadence of use. Add time between exposures and exams to allow the tube to cool. 2. Contact your Field Service Representative to repair the X-ray tube head fan.
I52 Detector calibration not optimum	Gain map calibration has not been performed.	Contact Field Service Representative.
I90 Auto-Decompression is Off	The automatic decompression mode has been inhibited by the Operator.	If auto–decompress mode is wanted, switch modes by changing the parameter in the set-up/Medical menu. Otherwise no action is required; this information is normally displayed.
S01 Aborted exposure	Exposure in progress has been aborted because the Exposure Button was released by Operator before the end of exposure.	Power OFF/ON from the X-ray Console. Start exam again.
S02 Exposure aborted by HV arcing	Exposure was aborted because more than eight X-ray tube arcing events occurred.	Power OFF/ON from the X-ray Console. Start exam again.
S05 Wrong selection of kV/track couple	Selected kV/focal track is not enabled (kV values are too low in the Rh focal track).	Change the configuration.
S07 Exposure aborted by IDC	The exposure was aborted by the Image Detection Controller.	1. Power OFF/ON from the X-ray Console. 2. If the problem occurs again at the next acquisition, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.

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Messages on X-ray Console	Explanation	Corrective Action
S08 Required power is too high	Power requested in manual mode is too high.	Reduce kV or mAs values.
S09 No compression detected	Breast is not compressed.	Breast compression is mandatory for AOP.
S10 Generator cooling mn	Generator requires xxxx minutes to cool.	Wait for cooling period (or select lower mAs values in manual mode).
S100 PLEASE WAIT ...	Generator requires xxxx minutes to cool.	Wait for cooling period (or select lower mAs values in manual mode).
S11 Tube cooling mn	Tube requires xxxxx minutes to cool.	Wait for cooling to terminate (or select lower mAs values in manual mode).
S12 Configuration not allowed	Incompatible settings of magnification, grid, and focal spot have been selected.	Select compatible settings.
S13 Backup mAs < 50 exposure inhibited>	Maximum mAs < 50. Exposure inhibited.	Wait for cooling to terminate (or select lower kV values).
S14 Maximum mAs exceeded	Maximum mAs set at installation are exceeded. This message appears only if a value below the maximum possible mAs value was set at installation.	Reduce the mAs value.
S20 Acq. Abort, image can be lost	Exposure has been fully performed but image may be lost because an error occurred in the image chain detection or processing.	1. Press the Exposure Interrupt button. 2. Check image quality if image appears. 3. Start exam again. 4. If the problem persists, power OFF the whole system and wait for the end of the shutdown sequence. 5. Restart the system. 6. If the problem occurs again, note ALL messages and inform your Field Service Representative.
S21 Waiting for AWS boot	Communication with AWS system is not yet established.	1. Wait until AWS boot and login is finished. 2. If message persists 10 min after the AWS login, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
S22 Waiting for IDC boot	Communication with Image Detection Control system is not yet established.	1. Wait until the Image Detection Control boot is finished. 2. If message persists for more than 10 min, power OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem occurs again, note ALL messages and inform your Field Service Representative.

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Messages on X-ray Console	Explanation	Corrective Action
S23 Laterality is not selected	You have not selected the Laterality of the breast to perform acquisition. Exposure is inhibited.	Select Laterality on the X-ray Console. If you are imaging a test object, the Laterality chosen is not important.
S25 Tube housing over temperature	The temperature of the tube housing is too high (> 65°C).	Wait for the tube housing temperature to fall.
S26 Exposure too long	The exposure is too long (this message should appear only in manual mode).	Increase the kV value or reduce the mAs value.
S32 Compression sensor fault	Breast thickness is badly calculated in AOP mode. It is still possible to continue the exam in manual mode.	Power OFF/ON from the X-ray Console. If the problem continues, note ALL messages and contact your Field Service Representative.
S33 Wait Until End of Digital Acquisit.	Acquisition is inhibited until the previous image has been completely recorded.	No action is required. The display of this message is normal during image transfer to the AWS. It will be cleared when system is ready for the next acquisition. If the problem persists, power OFF/ON from the X-ray Console.
S37 Exp. Abort, Wait Image Acquisition	Exposure in progress has been aborted by the Operator or the equipment but the system processed and displayed the generated image.	1. See the message displayed when the Exposure Interrupt button is lit for more information. 2. Press the Exposure Interrupt button and perform the action required by the last displayed message.
S38 Abort by HV arcing, Wait Image Acq.	Exposure was aborted because more than eight X-ray tube arcing events occurred, but the system processed and displayed the generated image.	1. See the message displayed when the Exposure Interrupt button is lit for more information. 2. Press the Exposure Interrupt button and perform the action required by the last displayed message.
S39 Abort by IDC, Wait Image Acquisition	The exposure was aborted by the Image Detection Controller, but the system processed and displayed the generated image.	1. See the message displayed when the Exposure Interrupt button is lit for more information. 2. Press the Exposure Interrupt button and perform the action required by the last displayed message.
S40 Stereo Config/ Exam incoherence	After power reset on the X-ray Console, the system has not retrieved the correct configuration.	Request a new stereotactic series by clicking the "New Series" button on the Viewer. The scout image must be acquired again.

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Messages on X-ray Console	Explanation	Corrective Action
S50 SP present, cannot continue exam	Stereotactic Positioner was detected as present with the Routine Medical Application open.	1) If Stereotactic Positioner is present: a) To open the Stereo Medical Application, first close the current exam. b) To use the Routine Medical Application, first remove the Stereotactic Positioner. 2) If Stereotactic Positioner is not present: a) Power OFF/ON from the X-ray Console. b) If the problem persists, shut down the system from the Browser. c) If the problem persists, note ALL messages and contact GEMS Field Service.
S52 System/stereo calibration missing	Gain map calibration has not been performed.	Contact your Field Service Representative
S57 AWS/POS communication lost	AWS cannot communicate with the Gantry. Acquisition is forbidden.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, shut down the system from the Browser. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
S58 Gantry failure	A Gantry failure is active, all Gantry movement is inhibited. It is not possible to start an exposure.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, shut down the system from the Browser. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
S59 Monofocus:magnifi. inhibited	The Gantry device configuration does not allow an exam. Unacceptable configurations: - Magnification paddle with Bucky inserted. - Non-magnification paddle with Magnification stand inserted. - Paddle not correctly inserted. - Sliding paddle in intermediate position. - Sliding paddle off-centered position and collimated view position do not match. - Gantry paddle and stereotactic positioner both installed.	Configure the Gantry device in conformance with the medical application: - Magnification paddle with Magnification stand only. - Non-magnification paddle with Bucky only. - No paddle with either Magnification stand or Bucky. - Paddle correctly inserted. - Sliding paddle in defined position. - No gantry paddle with the stereotactic positioner. - Or set the FOV position in concordance with the sliding paddle position. See section *5-1 Preparing the equipment on page 74* in Chapter 10 *Examination steering guide*.

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Messages on X-ray Console	Explanation	Corrective Action
S60 X-ray beam quality error	An error has occurred in firmware that controls X-ray beam or could affect X-ray beam quality. It could be the paddle detection or the control of the following devices: tube position (focus size), filter, Collimator, Bucky and locking mechanism. Note that a more detailed message appears (for 5s) on the Gantry LCD display.	1) Check the paddle position and paddle type display. 2) If the error is still displayed after paddle repositioning and paddle recognition (paddle name displayed when paddle is inserted): A. Wait 10s. If the X-ray inhibition stays active, power OFF/ON from the X-ray Console. B. If the problem persists, shut down the system from the AWS Browser. C. If the problem persists, note ALL messages and contact Field Service Representative.
S61 X-ray beam not ready	Firmware controlling the X-ray beam is not ready for acquisition. It may affect control of the tube position (focal spot size), the filter, the Collimator, or the Bucky.	1. Wait 30 seconds. If this X-ray inhibition stays active, power OFF/ON from the X-ray Console. 2. If the problem persists, shut down the system from the Browser. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
S81 Image detection not ready	One of the image detection components is busy or is not yet ready to acquire images.	1. Wait for completion of system setting. 2. If this X-ray inhibition remains displayed for more that 10 min., switch OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
S82 Image detection failure	One of the image detection components has failed.	1. Switch OFF the whole system and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
S83 Detector environment not OK	The detector environment is not correct for acquisition.	1. Wait for completion of system setting. 2. If this X-ray inhibition stays displayed for more that 10 min., switch OFF the whole system and wait for the end of the shutdown sequence. 3. Restart the system. 4. If the problem persists, note ALL messages and inform your Field Service Representative.
S84 Image quality is degraded	The temperature has drifted from the optimal value specified for best image quality.	Check image quality on current exam. If the problem persists, note ALL messages and inform your Field Service Representative.
S85 Detector environment failure	Detector environment control has failed.	1. Switch OFF the whole system and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, note ALL messages and inform your Field Service Representative.

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Messages on X-ray Console	Explanation	Corrective Action
S86 AWS/IDC Communication lost	AWS system cannot communicate with the Image Detection Controller system but communication should recover.	Wait until the Image Detector Controller system recovers.
S87 AWS/IDC Communication failure	AWS to Image Detection Controller system communication has failed.	1. Switch OFF the whole system and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
S88 AWS image delivery failure	AWS image delivery to medical application failure.	1. If this message stays displayed more that 5 min., switch OFF the whole system and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
S89 AWS not available for acquisition	The AWS cannot allow acquisition because of lack of disk space or an incomplete action on AWS.	1. Check that all actions are complete. 2. Increase free space on disk system by deleting exams that have been archived. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
S90 AWS not available, close exam	No more AWS resources to continue.	1. Close exam. 2. Increase free space on disk system by deleting exams that have been archived. 3. If the problem persists, note ALL messages and inform your Field Service Representative.
S91 Need user action on AWS	Operator input is required on AWS.	Respond to the AWS dialog box.
S92 AWS busy, please wait...	The AWS is busy, and the current operation may take some time.	No action required, wait for completion of the current operation.
S93 AWS busy	The AWS is busy (the wait should be short).	No action required, wait for completion of the current operation.
S94 System performing test, wait	An application is running on the system and performing tests that do not allow acquisition (example auto-diagnostics).	Wait a few minutes.
S95 Medical Application not active	AWS has not yet entered application mode. This message is always displayed after system boot and after each close exam even during review. It appears because no application is ready to get the image.	Start a new exam or QAP acquisition.

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Messages on X-ray Console	Explanation	Corrective Action
S96 System activity conflict	A diagnostic or calibration application is running while the medical application is active.	Check if several applications are running. If yes, close one.
S97 AWS reset in progress, wait	AWS is being reconfigured. The message appears until reconfiguration is complete.	No action required.
S98 Exp. inhibited CAL/ IQ in progress	AWS is being reconfigured. The message appears until reconfiguration is complete.	No action required.
S99 OFFSET ACQUISITION IN PROGRESS	AWS is being reconfigured. The message appears until reconfiguration is complete.	No action required.

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3 Operator messages displayed on the AWS LCD monitor

- Three main types of message are displayed on the AWS LCD monitor:
  - Information messages relating to power on/off events.
  - Information messages relating to boot/reset events.
  - Information messages relating to disk system or memory problems.

Table 2 Operator messages displayed on the AWS LCD monitor

Message on AWS screen		Explanation	Corrective action
AA *These messages relate to power on/off events:*			
AA1	Error: Could not connect to the remote provider !	The specified remote host could not be found. It may be temporarily off-line, its address may have changed or been incorrectly entered, the application on the remote provider may not be running, or there may be a network error.	1. Try again after a short wait. 2. If the message is repeated, check that the server address is correct and that the remote application is running. 3. If the problem persists, contact your Field Service Representative.
AA2	ATTENTION Do you really want to SHUT DOWN the complete system? This action will stop the workstation and the X generator!	This message appears as part of the normal shutdown sequence.	Click **Yes** or **No** as required.
AA3	End of remote connection in progress	A GE Insite connection is being closed.	No action is required; you can now use the system.
AA4	Image detection failure, exam forbidden	An image detection subsystem is not ready for acquisition after start-up.	1. Wait to see if the problem clears. 2. If the problem persists, contact your Field Service Representative.
AA5	Initialization not complete, please wait	A system initialization process is in progress.	Wait until system initialization is complete.
AA6	No Ups Power Backup	A UPS error has been detected or communication with the UPS has been lost.	1. Stop system usage and shut down the system. 2. Check the mains power supply. 3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system unless the batteries have been recharged. 4. Restart the system. 5. If the problem persists, contact your Field Service Representative.
AA7	Senograph failure, exam forbidden	A Senographe (Gantry) subsystem is not ready for acquisition after start-up.	1. Wait to see if the problem clears. 2. If the problem persists, contact your Field Service Representative.

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Message on AWS screen		Explanation	Corrective action
AA8	Shutdown Process started ...	The AWS shutdown process has been started because a UPS primary power failure longer than 10 seconds has been detected.	1. Wait for the end of the shutdown sequence. 2. Check mains power supply. 3. Restart the system when power OK. 4. If the problem persists, contact your Field Service Representative.
AA9	Shutdown Process started ...	The AWS shutdown process has been started because communication with the UPS was lost for more than 30 seconds.	1. Stop system usage and wait for the end of the shutdown sequence. 2. Restart the system. 3. If the problem persists, contact your Field Service Representative.
AA10	Shutdown Process started ...	The AWS shutdown process has been started because a UPS low battery condition was detected (battery power must be available to guarantee safe operation and shutdown in the event of power failure).	1. Stop system usage and wait for the end of the shutdown sequence. 2. Check the mains power supply. 3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system until the batteries have recharged. 4. If the problem persists, contact your Field Service Representative.
AA11	System is down. System will power off within 30 seconds: do NOT reboot now! (if system does not turn off, switch off UPS manually)	The message appears at the end of the normal shutdown sequence, when the UPS is about to shut down, to prevent users from trying to reboot.	No action is normally required. If the system fails to shut down completely (the AWS LCD monitor continues to display the message after one or two minutes), switch it off by pressing the **UPS OFF** button at the front of the Generator Cabinet.
AA12	System not ready, exam forbidden	A system component is not yet ready (after system start-up).	Wait until system initialization is complete before requesting an acquisition.
AA13	UPS battery needs replacing. Please call service	The UPS selftest has detected that the battery requires replacement.	Stop system usage and contact your Field Service Representative.
AA14	UPS output overload. Please call service	An UPS overload condition has been detected.	Stop system usage and contact your Field Service Representative.
BB *These messages relate to boot/reset events:*			
BB4	AWS reset in progress: please wait	An AWS boot or reset sequence is in progress. The AWS may start an automatic reset if it detects an internal acquisition device error.	Wait until system initialization is complete. If several automatic resets occur, contact your Field Service Representative.
BB6	Communication with UPS not established. Please call service. System will power off within 30 seconds: do NOT log in now!	This message appears at the end of the power-up/boot sequence, if communication cannot be established with the UPS.	1. Wait for the end of the shutdown sequence. 2. Try to restart the system. 3. If the problem is repeated, contact your Field Service Representative.

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Message on AWS screen		Explanation	Corrective action
BB8	Remote connection in progress : do not acquire images	A GE Insite connection is in progress; no new images should be acquired.	No action is required; wait for completion of the connection.
BB9	Restart browser must be performed to take into account the new configuration	Medical Application Preferences settings have been changed, and *Save* has been requested. The changes will not take effect until the Browser has been restarted.	Restart the Browser.
BB10	. System currently performing self-testing - Please Wait.	The system is busy with internal checks and tests.	No action required; wait for completion of the test.
BB11	Current processing is for QC purpose only.	*Fine View* is currently set to Disable, which is the configuration for Quality Check tests only. For a clinical use of the system, you need to reconfigure *Fine View* to Enable.	1. If you click QC procedure, you will perform QC tests without *Fine View*. 2. If you click OK, the dialog box will close, the exam will not be started. You need to go to Tools/Medical Application Preferences to set *Fine View* to Enable. See section *8-3-9 Image Process. on page 146*.
CC *These messages relate to internal disk system or memory problems:*			
CC1	ATTENTION Not enough space to continue	Disk system is full.	1. Increase free space on disk system by deleting exams that have been archived. 2. If the problem persists, contact your Field Service Representative.
CC2	AWS Reset failed	The Medical Application cannot allow acquisition because of lack of disk system space or an incomplete action on the AWS.	1. Check that all actions are complete (e.g., close all pop-up windows) and Increase free space on disk system by deleting exams that have been archived. 2. If the problem persists, contact your Field Service Representative.
CC3	Disk space is full, you cannot perform a new exam	Disk system is full.	1. Increase free space on disk system by deleting exams that have been archived. 2. If the problem persists, contact your Field Service Representative.
CC4	Image update failed on disk. You cannot save your	Disk system is full or server has failed.	1. Close exam. 2. Increase free space on disk system by deleting exams that have been archived. 3. If the problem persists, contact your Field Service Representative.
CC5	Medical Preferences Application was unable to get last settings	The file containing Medical Application Preferences settings does not exist or has been corrupted.	Note ALL messages and contact your Field Service Representative.

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Message on AWS screen		Explanation	Corrective action
CC6	Medical Preferences Application was unable to save current settings	The new Medical Application Preferences settings could not be saved, probably because of lack of space.	1. Increase free space on disk system by deleting exams that have been archived. 2. If the problem persists, contact your Field Service Representative.
CC7	Out of Memory, exam forbidden	System requirements exceed available AWS memory.	1. Perform system shutdown. 2. Start up system. 3. If the problem persists, contact your Field Service Representative.
CC8	Reallocation of disk space failed. There is no space	Disk system is full or server has failed.	1. Close exam. 2. Increase free space on disk system by deleting exams that have been archived. 3. Perform system shutdown, then restart system. 4. If the problem persists, contact your Field Service Representative.
CC9	System disk is full	System disk space is full.	1. Close exam. 2. Increase free space on disk system by deleting exams that have been archived. 3. Perform system shutdown, then restart system. 4. If the problem persists, contact your Field Service Representative.
CC10		The system is not able to format acquired image.	1. Close exam. 2. Increase free space on disk system by deleting exams that have been archived. 3. If the problem persists, contact your Field Service Representative.

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4 Operator messages on the Gantry readout

4-1 Messages regarding breast supports

Displayed to acknowledge Operator actions such as the selection of a new FOV. A prefix has been added to the message to order it in the table (the prefix is not displayed on the Gantry readout):

Prefix	Topic
(bs)	Breast supports = either Bucky or Magnification stands or Compression Paddles
(bsa)	Bucky
(bsb)	Magnification stands
(bsd)	Parallel sliding paddles
(bse)	Parallel non-sliding paddles
(bsg)	Flexible sliding paddles
(bsh)	Flexible non-sliding paddles
(bsk)	Magnification paddles
(bsm)	2D localization

Table 3 Messages regarding breast supports

	Messages regarding breast supports on Gantry readout	Explanation	Corrective Action
bs	Device removed	The system has detected that no device is present. - This message appears for 5 seconds when the breast support (e.g. Bucky, Magnification stand, etc.) or the Stereotactic Positioner is removed.	None. Note that the message appears for 5 seconds.
bsa	Bucky present	The system has detected that the Bucky is present.	If the Bucky is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsa	1st Spare Bucky	The system has detected that the Bucky detected is not the standard one. It has detected a type of Bucky that should not be used with the current version of the software.	If the system detects this, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.

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	Messages regarding breast supports on Gantry readout	Explanation	Corrective Action
bsg	Flexible sliding 19x23 paddle	The system has detected that the Flexible sliding 19 x 23 paddle is present. The paddle position is not indicated on the Gantry readout	If the Flexible sliding 19 x 23 paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsd	Sliding 19x23 paddle	The system has detected that the Sliding 19 x 23 paddle is present. The paddle position is not indicated on the Gantry readout	If the Sliding 19 x 23 paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsd	Sliding Round spot paddle	The system has detected that the Sliding Round spot paddle is present. The paddle position is not indicated on the Gantry readout.	If the Sliding Round spot paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsd	Sliding Square spot paddle	The system has detected that the Sliding Square spot paddle is present. The paddle position is not indicated on the Gantry readout.	If the Sliding Square spot paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bse	24x31 paddle	The system has detected that the 24 x 31 paddle is present.	If the 24 x 31 paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsh	Flexible 24x31 paddle	The system has detected that the Flexible 24 x 31 paddle is present.	If the Flexible 24 x 31 paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsb	1.5 Mag stand present. Remove face shield if present!	The system has detected that the 1.5 Magnification stand is present and reminds the Operator that the face shield must be removed for the diagnostic application.	1. If the 1.5 Magnification stand is installed, remove the face shield if not yet done. 2. If the magnification stand is not installed, an error has occurred: a) Power OFF/ON from the X-ray Console. b) If the problem persists, note ALL messages and contact your Field Service Representative.
bsb	1.8 Mag stand present. Remove face shield if present!	The system has detected that the 1.8 Magnification stand is present and reminds the Operator that the face shield must be removed for the diagnostic application.	1. If the 1.8 Magnification stand is installed, remove the face shield if not yet done. 2. If the magnification stand is not installed, an error has occurred: a) Power OFF/ON from the X-ray Console. b) If the problem persists, note ALL messages and contact your Field Service Representative.

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	Messages regarding breast supports on Gantry readout	Explanation	Corrective Action
bsm	2D Large Localization Paddle. Maximum recommended force is 20daN.	The system has detected that the 2D Large localization paddle is present and reminds the Operator that it is recommended to not exceed 20daN with this paddle.	If the 2D Large localization paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bs	No defined paddle	The system has detected that it does not detect a Senographe Essential paddle.	If you observe this message when a Senographe Essential paddle is present, contact your Field Service Representative.
bsk	Round Spot Magnification paddle	The system has detected that the Round Spot Magnification paddle is present. This paddle should be used with a magnification stand.	If the Round Spot Magnification paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsd	Axillary paddle	The system informs the operator that the Axillary paddle is present.	If the Axillary paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsm	2D Spot Localization Paddle. Maximum recommended force is 20daN	The system has detected that the 2D Spot localization paddle is present and reminds the Operator that it is recommended to not exceed 20daN with this paddle.	If the 2D Spot localization paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsk	Square Magnification paddle	The system has detected that the Square Spot Magnification paddle is present. This paddle should be used with a magnification stand.	If the Square Spot Magnification paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bsk	19x23 Magnification paddle	The system has detected that the 19 x 23 Magnification paddle is present. This paddle should be used with a magnification stand.	If the 19 x 23 Magnification paddle is not installed, an error has occurred: 1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
bs	Unexpected paddle type	Paddle device error	Note ALL messages and contact your Field Service Representative.

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	Messages regarding breast supports on Gantry readout	Explanation	Corrective Action
bs	Unknown paddle type	The system has detected that the installed paddle is not recognized.	If the paddle is a Senographe Essential accessory: 1. Remove the paddle and insert it again. 2. If the message is still displayed after inserting: A. Power OFF/ON from the X-ray Console. B. If the problem persists, use another Senographe Essential paddle. C. If the problem persists, note ALL messages and contact your Field Service Representative.

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4-2 Messages regarding FOV (Field Of View)

Table 4 Messages regarding FOV on the Gantry readout

Messages regarding FOV on Gantry readout	Explanation	Corrective Action
FOV 9x9	The system has detected that the selected FOV is 9 cm deep and 9 cm wide.	Press the FOV size button if you want to set another FOV. Press the FOV position button if you want to off-center the FOV to the left or to the right of the detector. The off-centered FOV corresponding to the centered FOV 9 x 9 is 9 x 19.
FOV 13x18	The system has detected that the selected FOV is 13 cm deep and 18 cm wide.	Press the FOV size button if you want to set another FOV. Press the FOV position button if you want to off-center the FOV to the left or to the right of the detector. The off-centered FOV corresponding to the centered FOV 13 x 18 is 13 x 20.7.
FOV 13x23	The system has detected that the selected FOV is 13 cm deep and 23 cm wide. This FOV is used in magnification view only.	Press the FOV size button if you want to set another FOV. Pressing the FOV position button has no effect for this FOV.
FOV 19x23	The system has detected that the selected FOV is 19.2 cm deep and 23 cm wide, and that it is centered.	Press the FOV size button if you want to set another centered FOV. Press the FOV position button if you want to off-center the FOV to the left or to the right of the detector. The off-centered FOV corresponding to the centered FOV 19.2 x 23 is 19.2 x 23.
FOV 19x23 Left or FOV 19x23 Right	The system has detected that the selected FOV is 19.2 cm deep and 23 cm wide and that it is off-centered to the left (or right, respectively).	Press the FOV size button if you want to set another FOV off-centered in the same way. Press the FOV position button if you want to set another FOV position for the same format. The centered FOV corresponding to the off-centered FOV 19.2 x 23 is 19.2 x 23
FOV 24x31	The system has detected that the selected FOV is 24 cm deep and 31 cm wide.	Press the FOV size button if you want to set another FOV. Note: Pressing the FOV position button has no effect as it is not possible to off-center the 24 x 31 FOV.
FOV 9x19 Left	The system has detected that the selected FOV is 9 cm deep and 19 cm wide and that it is off-centered to the left side of the detector.	Press the FOV size button if you want to set another FOV off-centered in the same way. Press the FOV position button if you want to set another FOV position for the same format. The centered FOV corresponding to the off-centered FOV 9 x 19 is 9 x 9.

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Messages regarding FOV on Gantry readout	Explanation	Corrective Action
FOV 9x19 Right	The system has detected that the selected FOV is 9 cm deep and 19 cm wide and that it is off-centered to the right side of the detector.	Press the FOV size button if you want to set another FOV off-centered in the same way. Press the FOV position button if you want to set another FOV position for the same format. The centered FOV corresponding to the off-centered FOV 9 x 19 is 9 x 9.
FOV 13x21 Left	The system has detected that the selected FOV is 13 cm deep and 20.7 cm wide and that it is off-centered to the left side of the detector.	Press the FOV size button if you want to set another FOV off-centered in the same way. Press the FOV position button if you want to set another FOV position for the same size. The centered FOV corresponding to the off-centered FOV 13 x 20.7 is 13 x 18.
FOV 13x21 Right	The system has detected that the selected FOV is 13 cm deep and 20.7 cm wide and that it is off-centered to the right side of the detector.	Press the FOV size button if you want to set another FOV off-centered in the same way. Press the FOV position button if you want to set another FOV position for the same size. The centered FOV corresponding to the off-centered FOV 13 x 20.7 is 13 x 18.
A04 Compression status is unknown	A lift or rotation movement has been requested while the Stereotactic Positioner is not ready.	1) If the Stereotactic Positioner has just been installed, wait for the "READY" message on the SP display before pressing a footswitch or control movement button. 2) If "COMMUNICATION NOT ESTABLISHED" is displayed on the SP display, perform the corrective action for this error. When the system has recovered, move the gantry as required. 3) Check the X-ray Console for error messages and perform appropriate corrective actions. 4) If the problem persists, power OFF/ON from the X-ray Console. 5) If the problem persists, note ALL messages and contact GEMS Field Service.
A12 Move tube head to center position	Rotation movement has been requested with the tube head angled away from the center position (0°).	1) If the Stereotactic Positioner is installed, switch back to angulation mode and move tube head to the center position (0°). 2) If the Stereotactic Positioner is not installed, an error has occurred: A. Power OFF/ON from the X-ray Console. B. If the problem persists, note ALL messages and contact GEMS Field Service.

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4-3 Error messages

- *Advisory messages* with a prefix *Axx*: Displayed to warn the Operator when a requested operation is not possible.
- *Halt messages* with a prefix *Hxx*: Displayed to warn the Operator that a non-recoverable error has been detected. The system must be restarted by switching OFF/ON from the X-ray Console.
- *Warning messages* with a prefix *Wxx*: Displayed to warn the Operator when an error has been detected that does not prevent continued operation.
- *Interdiction messages* with a prefix *Xxx*: Displayed to warn the Operator when an error has been detected that prevents making an X-ray acquisition.

Table 5 Error messages on the Gantry readout

Messages on Gantry readout	Explanation	Corrective Action
A02 Compression force is applied	lift (Arm elevation) and rotation movements are not allowed because a compression force is applied.	Decompress the breast (move the paddle holder up) if you want to perform a rotation or a lift movement.
A03 Compression is not operational	lift (Arm elevation), rotation and compression movements are not allowed because the compression device is not operational. Compression status is temporarily unknown.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
A04 Compression status is unknown	A lift or rotation movement has been requested while the Stereotactic Positioner is not ready.	1) If the Stereotactic Positioner has just been installed, wait for the "READY" message on the SP display before pressing a footswitch or control movement button. 2) If "COMMUNICATION NOT ESTABLISHED" is displayed on the SP display, perform the corrective action for this error. When the system has recovered, move the gantry as required. 3) Check the X-ray Console for error messages and perform appropriate corrective actions. 4) If the problem persists, power OFF/ON from the X-ray Console. 5) If the problem persists, note ALL messages and contact GEMS Field Service.
A05 Compression upper position is reached	1. Compression release movement is stopped because the upper position with the current paddle is reached. or 2. The upper position of the paddle holder is reached.	1. If you have a paddle, remove it to go to the paddle holder upper position. or 2. If the paddle is removed and the paddle holder is not at upper position, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
A06 Lift end position is reached	lift (Arm elevation) movement is stopped because the upper or lower position is reached.	Move the lift in the opposite way.
A07 Lift is not operational	lift (Arm elevation) movement is not allowed because the lift device is not operational.	None
A08 Max manual compression force is reached	The system has detected that the maximum force allowed is reached.	No more compression is available, even using manual compression.
A09 Max power driven compression force is reached	The system has detected that the maximum force allowed for motorized movement is reached.	1. Use the manual control to compress more. 2. If the maximum power driven force is < 20 daN, use the Medical Menu to set a higher value.
A10 Motion stopped. Multiple movements are requested	The current movement is stopped because another non-compatible movement is requested: This advisory message occurs: A. If you press a Operator interface (button or footswitch) during a pre-set movement. B. If you press a pre-set button while a previous movement is in progress (including deceleration phase).	Release all footswitches or buttons and wait for all movement to stop before pressing on the footswitch or the Gantry control movement button again.
A12 Move tube head to center position	Rotation movement has been requested with the tube head angled away from the center position (0°).	1) If the Stereotactic Positioner is installed, switch back to angulation mode and move tube head to the center position (0°). 2) If the Stereotactic Positioner is not installed, an error has occurred: A. Power OFF/ON from the X-ray Console. B. If the problem persists, note ALL messages and contact GEMS Field Service.
A14 Risk of collision with floor	lift (Arm elevation) or Rotation movement is stopped to avoid a collision with the floor.	Select another Arm Rotation angle.
A15 Rotation end position is reached	The rotation movement is stopped because it has reached its rotation limit. - Max negative rotation is -165° - Max positive rotation is +185°	1. If you want to reach the From Below position rotate the Arm to +180° (max negative rotation is -165°) 2. If the system stops before reaching +185° or -165° position, note ALL messages and contact your Field Service Representative.
A18 Rotation is not operational	Rotation movement is not allowed because the Rotation device is not operational.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
A23 Compression lower position is reached	Compression movement is stopped because the lower position of the paddle holder is reached. - You get this error when you perform a compression movement without a paddle or with a paddle for magnification view without the Magnification stand installed.	1. Move the paddle holder up (press the compression release footswitch). 2. If you have the Bucky installed, perform compression with a paddle intended for use in contact views (with the Bucky). 3. If you get this message with a paddle intended for use in contact views (not magnification) and with the Bucky installed, an error occurred. Note ALL messages and contact your Field Service Representative.
A24 Maximum compression force is reached	The system has detected that the maximum force allowed is reached.	No more compression is available, even using manual compression.
A25 Button disabled (was pressed at boot). Use other keypad or reboot.	A Gantry button was pressed during the boot sequence while the Gantry checked its devices. The button that was pressed is not functional until the next reboot.	1. If you have pressed a button: If you want to use this Operator interface power OFF/ON from the X-ray Console. If not, continue to use the system with this button non-functional. 2. Even if you have not pressed a button during the boot sequence, a Operator interface will not be functional: A. To avoid problems during an exam, power OFF/ON from the X-ray Console. B. If this message occurs frequently, contact your Field Service Representative.
A26 Something is preventing decompression movement	To avoid pinching patient or Operator body part between the paddle (or paddle holder) and the face shield (or X-ray tube head), the decompression motion stopped as soon as a negative force was detected.	1. Check if something is pressing on the paddle that could prevent continuing or starting a compression release movement. A. If an object is stopping the movement, move this object to allow motorized decompression. B. If the patient is pressing on the paddle, try to change her position to allow motorized decompression. 2. If error occurs again while space is free, use the manual decompression. 3. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
A50 Breast support locking mechanism is not operational	The Breast support locking or release movement is not allowed because another incompatible movement is in progress: This advisory message occurs: A. If you press both breast support release buttons during a compression or compression release movement. B. If you insert a breast support (Bucky or magnification stand) during a compression or compression release movement.	1) Release breast support release buttons or slide the breast support away from its locked position. 2) Wait until all movements have stopped before pressing again on the breast support unlocking buttons or before inserting again the breast support.
A51 Press both breast support unlocking buttons to release.	Only one breast support unlocking button is pressed while both are necessary.	1) Release the breast support unlocking button(s). 2) Press again on both breast support unlocking buttons. 3) If the problem persists, note ALL messages and contact your Field Service Representative.
A52 A breast support unlocking button is declared failed	A breast support unlocking button is pressed while it has been declared failed; the breast support therefore cannot be released.	1) Check that no object or body part is pressing on a breast support unlocking button. A. If an object is pressing the button, move this object to free the button. B. If the patient is pressing the button, try to change her position to avoid her pressing the button. 2) Power OFF/ON from the X-ray Console. 3) If the problem persists, note ALL messages and contact your Field Service Representative.
A53 Incorrect gantry device config. (check breast holder; paddle; FOV)	Gantry device configuration does not allow an exam. Compression is inhibited: Unacceptable configurations: - Breast holder recognized but not correctly locked. - Magnification paddle with Bucky inserted. - Non-magnification paddle with Magnification stand inserted. - Paddle not correctly inserted. - Sliding paddle in intermediate position. - Sliding paddle off-centered position and collimated view position do not match.	Insert the Gantry device in conformance with the medical applications: - Bucky or Magnification stand fully locked. - Magnification paddle with Magnification stand only. - Non-magnification paddle with Bucky only. - No paddle with either Magnification stand or Bucky. - Paddle correctly inserted. - Sliding paddle in defined position. - Or set the FOV position in concordance with the sliding paddle position. See section *5-1 Preparing the equipment on page 74* in Chapter 10 *Examination steering guide* for authorized configurations.

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Messages on Gantry readout	Explanation	Corrective Action
A54 Locking at wrong pos. Press both breast support unlocking buttons	The Breast support locking movement is not allowed because the mechanism is not in insertion position.	1) Press both breast support unlocking buttons. 2) Wait until locking release movement has stopped. 3) Insert again the breast support. 4) If the problem persists, note ALL messages and contact your Field Service Representative.
H01 Button interface comm. failure	The system is set in emergency mode: - A button failure occurred; the system is set in "halt" state. - It is not possible to perform any movement or image acquisition.	1. Decompress the patient using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H02 Compression comm. failure	The system is set in emergency mode: - The compression device is not communicating; the system is set in "halt" state. - It is not possible to perform any movement or image acquisition.	1. Decompress the patient using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H03 Compression control failure	The system is set in emergency mode: - The compression device has failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H04 Internal software error	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H05 Internal software error	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
H06 Lift communication failure	The system is set in emergency mode: - The lift (Arm elevation) device is not communicating, the system is set in "halt" state. - It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H07 Lift control failure	The system is set in emergency mode: - The lift (Arm elevation) device is failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H08 Power supply unit comm. Failure	The system is set in emergency mode: - The Power unit is not communicating; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H09 Reset the system. Reload the SW	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. (occurred only during software upgrade) -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H10 Reset the system. Reload the SW	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. (occurred only during software upgrade) -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H11 Reset the system. Reload the SW	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. (may occurr only during software upgrade) -It is not possible to perform any movement or image acquisition.	1. Power OFF from the X-ray Console. 2. Contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
H12 Reset the system. Reload the SW	The system is set in emergency mode: - An error occurred on the Gantry CPU; the system is set in "halt" state. (may occurr only during software upgrade) -It is not possible to perform any movement or image acquisition.	1. Power OFF from the X-ray Console. 2. Contact your Field Service Representative.
H13 Rotation communication failure	The system is set in emergency mode: - The Rotation device is not communicating, the system is set in "halt" state. - It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H14 Rotation control failure	The system is set in emergency mode: - The Rotation device is failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H17 Stop motion control line failed	The system is set in emergency mode: - Stop movement command failure; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H18 Stop motion line active	The system is set in emergency mode: - The stop movement button has been pressed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H19 Compression footswitch failure	The system is set in emergency mode: - Compression footswitch failure; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
H20 Lift footswitch failure	The system is set in emergency mode: - lift (Arm elevation) footswitch failure; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H21 Lift software error	The system is set in emergency mode: - An error occurred on lift (Arm elevation) device CPU; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H22 Halt. Uncontrolled lift motion	The system is set in emergency mode: - Uncontrolled lift (Arm elevation) movement; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H23 Rotation brake failure	The system is set in emergency mode: - The Arm rotation brake has failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H24 Rotation software error	The system is set in emergency mode: - An error occurred on the rotation device CPU; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H25 Halt. Rotation Uncontrolled	The system is set in emergency mode: - Uncontrolled Rotation movement; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
H27 Compression brake failure	The system is set in emergency mode: - The compression device is in fault state; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Power OFF/ON from the X-ray Console. 2. Try to perform compression motion. If the problem persists, note ALL messages and contact your Field Service Representative.
H28 Control button failure on arm	The system is set in emergency mode: - An Arm movement control button on an Arm keypad (behind the image receptor, left or right) has failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H29 Control button failure on head	The system is set in emergency mode: - An Arm movement control button on an X-ray tube head keypad (left or right) has failed; the system is set in "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H30 Please turn off control console	The system cannot shut down the generator and X-ray Console. - case A. Following an Operator request on the Browser. - case B. Following a generator error that requested generator shutdown. A system shut down should be requested manually.	1. Power OFF on the X-ray Console (immediately in case B!). 2. If the error occurred during a normal shut down: A. Note ALL messages and contact your Field Service Representative. B. You can continue to use the system but you must power OFF from the X-ray Console at the next occurrence of this error.
H31 Positioner power supply failure	The system is set in emergency mode: - Gantry power supply failure; the system is set in a "halt" state. -It is not possible to perform any movement or image acquisition.	1. Decompress the patient, using the manual compression knobs. 2. Power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
H32 Tube head control failure	The system is in emergency mode: - Control command from X-ray tube head has failed, the system is set to "halt" state. - It is not possible to perform any movement or image acquisition.	1) Decompress the patient using the manual compression knobs. 2) Power OFF/ON from the X-ray Console. 3) If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
H34 Tube head communication failure	The system is in emergency mode: - X-ray tube head control is not communicating, the system is set to "halt" state. - It is not possible to perform any movement or image acquisition.	1) Decompress the patient using the manual compression knobs. 2) Power OFF/ON from the X-ray Console. 3) If the problem persists, note ALL messages and contact your Field Service Representative.
W01 Internal software error	An error occurred on the Gantry CPU that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next service maintenance.
W02 Internal software error	An error occurred on the Gantry CPU that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next service maintenance.
W03 Internal software error	An error occurred on the Gantry CPU that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next field service Service maintenance.
W04 Internal software error	An error occurred on the Gantry CPU that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next field service Service maintenance.
W05 Internal software error	An error occurred on the Gantry CPU that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next service maintenance.
W06 Invalid language. Default is used	The Gantry CPU received incorrect language information and will use the default value. The default language value is the English language.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, continue to use the system with English language set. Note ALL messages and contact your Field Service Representative.
W07 Control buttons error	An error occurred on an Arm control button keypad, which does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next field service maintenance.
W08 A footswitch is pressed	An error occurred on a footswitch device that does not affect the current system use.	Note ALL messages and inform your Field Service Representative at next field service maintenance.
W09 Gantry Readout failure	The Gantry readout has failed.	This message cannot be seen if the Gantry readout has failed. If no more messages cannot be displayed on the Gantry readout, contact your Field Service Representative.
W10 Lift calibration error	The lift (Arm elevation) device is not correctly calibrated; no movement will be available until the lift device is correctly calibrated.	Note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
W11 Lift control error	An error occurred during lift (Arm elevation) movement that does not affect the safety control but the speed profile only.	Note ALL messages and contact your Field Service Representative.
W12 Lift end position exeeded	The lift (Arm elevation) movement has stopped at a firmware limit, but should have stopped before.	1. Use lift slow speed in the upper and lower limit area. 2. Note ALL messages and contact your Field Service Representative.
W15 Rotation calibration error	The rotation device is not correctly calibrated; no movement will be available until the rotation device has been correctly calibrated.	Note ALL messages and contact your Field Service Representative.
W17 Rotation control error	An error occurred during rotation movement. It does not affect the safety control, but only the speed profile.	Note ALL messages and contact your Field Service Representative.
W18 Rotation end position exceeded	A rotation movement has stopped at a firmware limit, but should have stopped before.	1. Use rotation slow speed in the upper and lower limit area. 2. Note ALL messages and contact your Field Service Representative.
W21 A button is pressed on the arm keypad	An Arm movement control button on an Arm keypad (behind the image receptor, left or right) was pressed during the boot sequence while the Gantry checked its devices. The button that was pressed is not functional until the next reboot.	1. If you have pressed a button: If you want to use this Operator interface, power OFF/ON from the X-ray Console. If not, continue to use the system with this button non-functional. 2. Even if you have not pressed a button during the boot sequence, a Operator interface will not be functional: A. To avoid problems during an exam, power OFF/ON from the X-ray Console. B. If this message occurs frequently, contact your Field Service Representative.
W22 Compression calibration error	The compression device is not correctly calibrated; no movement will be available until the compression device has been correctly calibrated.	Note ALL messages and contact your Field Service Representative.
W23 Compression control error	An error occurred during compression movement; it does not affect the safety control, but only the speed profile.	Note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
W24 A button is pressed on the head keypad	An Arm movement control button on a X-ray tube head keypad (left or right) was pressed during the boot sequence while the Gantry checked its devices. The button that was pressed is not functional until the next reboot.	1. If you have pressed a button: If you want to use this Operator interface, power OFF/ON from the X-ray Console. If not, continue to use the system with this button non-functional. 2. Even if you have not pressed a button during the boot sequence, a Operator interface will not be functional: A. To avoid problems during an exam, power OFF/ON from the X-ray Console. B. If this message occurs frequently, contact your Field Service Representative.
W25 Tube cooling; fan error	The system is in degraded mode: - The X-ray tube head fan has failed. As a result, tube cooling is not efficient and the tube thermal algorithm could not prevent exposure abort due to tube overheating.	1. The system can continue to be used but please reduce the cadence of exposures: Add time between exposures and exams to allow the tube to cool. 2. Contact your Field Service Representative to repair the X-ray tube head fan.
W26 Positioner power supply error	An error is detected by the Gantry power unit that does not affect the safety control.	Note ALL messages and contact your Field Service Representative.
W27 Positioner power supply over temperature	Gantry power unit cooling is in a fault condition; the system risks being set to an emergency state.	1. Note ALL messages and contact your Field Service Representative. 2. You can continue to use the system but power OFF from the X-ray Console as soon as you can.
W28 Switching off Gantry	Gantry power OFF sequence is in progress.	Wait for the end of the power OFF sequence.
W29 Paddle detection error	Paddle detection has failed, or paddle type identification label is not aligned with the detection window.	1. Remove the paddle and insert it again. 2. If the error persists, try using another paddle. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
W30 Check sliding paddle position	The sliding paddle is not in correct position.	1. Slide the paddle and stop when predefined position is reached. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
W31 No defined paddle detected	AOP mode (Automatic Optimization of Parameters) is inhibited when the paddle type is not recognized.	If the paddle is a Senographe Essential accessory: 1. Remove the paddle and insert it again. 2. If the message is still displayed after inserting: A. Power OFF/ON from the X-ray Console. B. If the problem persists, use another Senographe Essential paddle or perform the acquisition in manual mode. C. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
W32 Caution: anti-collision with floor is not operating correctly.	An error occurred during lift (Arm elevation) movement that does not affect the safety control but the lift's absolute position is lost. A consequence of this error is that rotation movement can be unpredictable. For example, when the X-ray tube head is near to the floor the rotation movement will not stop in order to avoid collision with the floor, or when the X-ray tube head is far away from the floor the rotation movement may stop unnecessarily.	1) Be careful when performing lift movements with the X-ray tube head near to the floor and ensure that the patient's or Operator's feet cannot be trapped. 2) If the problem persists, take a note of ALL the error messages and contact a Field Service Representative.
W34 Automatic force reduction activated (high compression force)	The maximal manual compression force has been reached	Stop the increase in compression force using manual compression.
W35 Automatic force reduction failed. Do not use high force	The maximal manual compression force has been reached	Stop the increase in compression force using manual compression. Try to reduce the compression force if possible.
W50 A breast support unlocking button is pressed.	One or both breast support unlocking button(s) pressed AND positioner is booting.	1) Check that no object or body part is pressing on a breast support unlocking button. A. If an object is pressing the button, move this object to free the button. B. If the patient is pressing the button, try to change her position to avoid her pressing the button. 2) Power OFF/ON again from the X-ray Console else the unlocking button will be declared failed and will not allow you to unlock the breast support.
W51 Breast support unlocking button failed	A breast support release button is declared failed because it has been detected being pressed for a long time (more than 5s). There is no risk to continue the current exam; the breast support is still locked.	1. Check that no object or body part is pressing on a breast support release button. A. If an object is pressing the button, move this object to free the button. B. If the patient is pressing the button, try to change her position to avoid her pressing the button. 2. Continue the current exam. (Note that message A52 will appear at next breast support release request.)
W52 Breast support locking mecanism error	The breast support locking device detects an error that does not affect the safety control.	Note ALL messages and contact Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
X01 AWS communication failure	The Gantry state cannot allow an acquisition: - The Gantry is not communicating with the AWS. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, shut down the system from the Browser. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
X02 Bucky communication failure	The Bucky state cannot allow an acquisition: - The Bucky is not communicating. - It is not possible to perform an image acquisition.	1. Release the Bucky. 2. Reinstall the Bucky: check that it is correctly installed and switched on (initialization noise heard). 3. Power OFF/ON from the X-ray Console. 4. If the problem persists, note ALL messages and contact your Field Service Representative.
X03 Bucky control failure	The Bucky state cannot allow an acquisition: - The Bucky device is in a fault state. - It is not possible to perform an image acquisition.	1. Release the Bucky. 2. Reinstall the Bucky: check that it is correctly installed and switched on (initialization noise heard). 3. Power OFF/ON from the X-ray Console. 4. If the problem persists, note ALL messages and contact your Field Service Representative.
X04 Collimation communication failure	The FOV cannot be set at the correct format: - The Collimator is not communicating. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X05 Collimation control failure	The FOV cannot be set at the correct format: - The Collimation function is failed. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X06 Generator communication failure	The Gantry state cannot allow an acquisition: - The Gantry is not communicating with the Generator. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X07 Invalid bucky type	The Gantry does not recognize the Bucky device. - It is not possible to perform an image acquisition.	1. Release the Bucky. 2. Reinstall the Bucky: check that it is correctly installed and switched on (initialization noise heard). 3. Power OFF/ON from the X-ray Console. 4. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
X09 Compression paddle detection error	The Gantry does not recognize the paddle. - The compression thickness cannot be computed accurately. - It is not possible to continue the current exam, exposure is inhibited.	1. Remove and reinstall the paddle. 2. If the problem persists, power OFF/ON from the X-ray Console. 3. If the problem persists, note ALL messages and contact your Field Service Representative.
X10 X-ray beam form software error	An error occurred during X-ray beam format computation by the Gantry CPU. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X11 Tube head communication failure	The tube focal spot size cannot be set: - The X-ray tube head device is not communicating. - It is not possible to perform an image acquisition.	1. If you hear the tube tilt motor, the system is trying to recover itself. 2. If the message "S61 X-ray beam not ready" is present more than 60s on the X-ray Console, power OFF/ON from the X-ray Console. 3. If the problem persists, shut down the system from the Browser. 4. If the problem persists, note ALL messages and contact your Field Service Representative.
X12 Tube head control failure	The tube focal spot size cannot be set: - The X-ray tube head device has failed. - It is not possible to perform an image acquisition.	1. If you hear the tube tilt motor, the system is trying to recover itself. 2. If the message "S61 X-ray beam not ready" is present for more than 60 seconds on the X-ray Console, power OFF/ON from the X-ray Console. 3. If the problem persists, shut down the system from the Browser. 4. If the problem persists, note ALL messages and contact your Field Service Representative.
X13 X-ray beam adjustment error	The X-ray tube head device that positions the tube to get the correct X-ray beam position has detected an error. - The tube focal spot size cannot be set correctly. - It is not possible to perform an image acquisition.	1. If you hear the tube tilt motor, the system is trying to recover itself. 2. If the message "S60 X-ray beam quality error" is present for more than 10s on the X-ray Console, power OFF/ON from the X-ray Console. 3. If the problem persists, shut down the system from the AWS Browser. 4. If the problem persists, note ALL messages and contact your Field Service Representative.
X14 X-ray beam form calibration error	The tube focal spot size cannot be set correctly. - It is not possible to perform an image acquisition except during calibration.	Note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
X15 Collimator command error	The Collimator device that positions the Collimator blades detected an error. - The FOV cannot be set correctly. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X16 Collimator control failure	The Collimator device has failed: - The FOV cannot be set correctly. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X17 Collimator software error	An error occurred on the Collimator device CPU: - The FOV and the filter cannot be set correctly. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X18 Filter command error	The Filter device that positions the filter detected an error. - The filter cannot be set correctly. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X19 Filter control failure	The Filter device has failed: - The filter cannot be set correctly. - It is not possible to perform an image acquisition.	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.
X50 Breast support locking mechanism communication failure	The state of the breast support locking mechanism cannot be determined: - The breast support locking device is not communicating. - It is not possible to perform an image acquisition (Bucky or magnification plate could be incorrectly positioned).	1. Power OFF/ON from the X-ray Console. 2. If the problem persists, note ALL messages and contact your Field Service Representative.

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Messages on Gantry readout	Explanation	Corrective Action
X51 Breast support not fully locked	The state of the breast support locking mechanism cannot allow an image acquisition: - The breast support locking device is in faulty state. - It is not possible to perform an image acquisition (Bucky or magnification stand could be incorrectly positioned).	1) Try to release the breast support using both unlocking buttons. 2) When the breast support is released, remove it and insert it again. 3) If the problem persists, power OFF/ON from the X-ray Console. 4) If the problem persists, note ALL messages and contact your Field Service Representative.
X52 Breast support locking mechanism control failure	The breast support locking device has failed: - It is not possible to perform an image acquisition (Bucky or magnification stand could be incorrectly positioned).	1) Try to release the breast support using both unlocking buttons. 2) When the breast support is released, remove it and insert it again. 3) If the problem persists, power OFF/ON from the X-ray Console. 4) If the problem persists, note ALL messages and contact your Field Service Representative.

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Chapter 27 System Hygiene

1 Introduction

This chapter describes hygienic maintenance procedures which must be performed regularly to maintain hygienic condition of the Senographe equipment.

Adequate hygienic maintenance is essential to prevent disease transmission.
Be sure to thoroughly hygienically maintain equipment surfaces which contact the patient.

1-1 Definition of hygienic practices

1-1-1 Cleaning

Cleaning is a process involving detergent or enzymic presoak that removes visible soil (e.g. blood or protein substances) from an object.

1-1-2 Low-level disinfection

Low-level disinfection eliminates vegetative bacteria, some fungi, and lipid viruses.

1-1-3 High-level disinfection

High-level disinfection eliminatesall forms of microbial life, except for large numbers of bacterial spores.

1-1-4 Sterilization

Sterilization is a validated process used to render product free from viable microorganisms.

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2 Types of hygienic maintenance to perform based on part of system

Three types of hygienic maintenance exist, depending on the level of contact that occurs with the patient:

- **No contact** - parts which do not normally contact the patient.

Gantry column and arm covers
Digital detector
See also section 4-2 Cleaning the digital detector on page 266
Footswitches
Gantry readout

Radiation screen
AWS LCD monitor
See also section 4-1 Cleaning the monitor on page 266.
Mouse or trackball
X-ray Console and AWS keyboard
Control Station covers

Stereotactic Positioner (option)

These parts can be **cleaned** as required, as described in section *4 Cleaning procedures (no contact parts) on page 266*.

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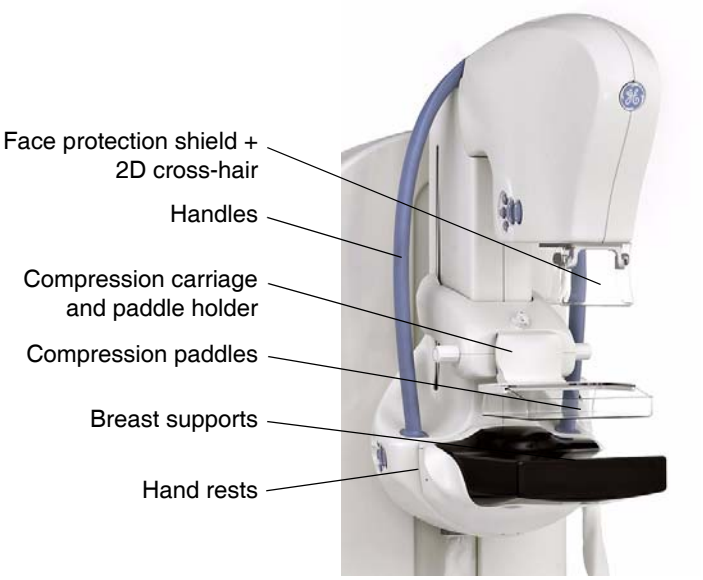
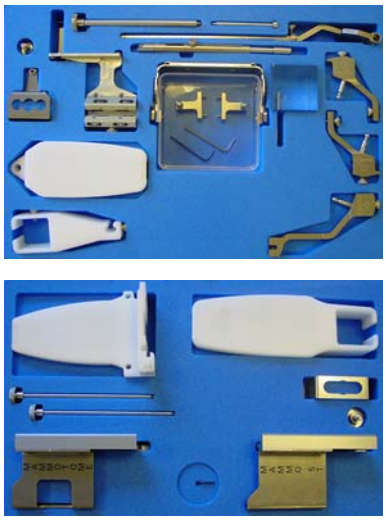
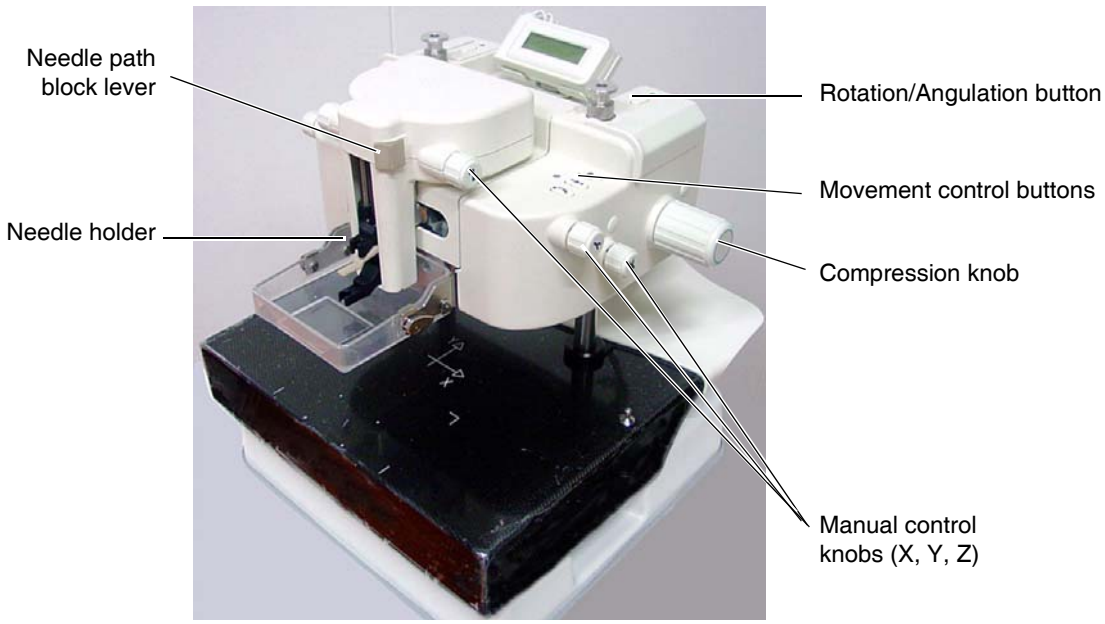
- **Contact** - parts which contact the patient without penetrating "intact" or "non-intact" skin.



All parts of the Lateral & Vertical approach kits (option)



Stereotactic Positioner (option)



These parts must be **disinfected** between patients as described in section *5 Disinfection procedures (contact parts) on page 267*.

The level of disinfection (*low-level or high-level*) to perform depends on the state of the patient, and medical procedure. See *5-4 Determine required disinfection level on page 267* for more information.

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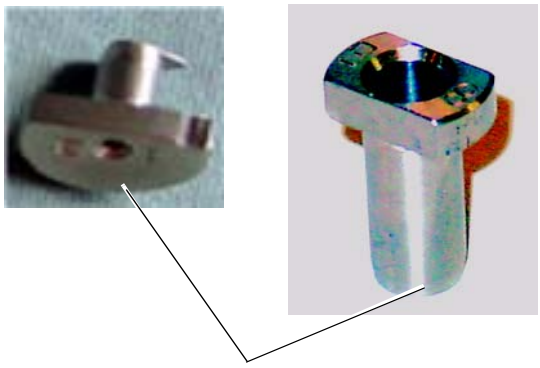
- **Acute contact** - penetrating parts which routinely penetrate the skin, and parts which are in direct contact with those penerating parts.



Metal needle guides (or known as metal bushings)

These parts must be **sterilized** between patients as described in section *6 Sterilization procedures (acute contact parts) on page 269*.

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3 General precautions for hygienic maintenance

CAUTION

Improper cleaning methods or the use of certain cleaning and disinfecting agents can damage the equipment, cause poor imaging performance or increase the risk of electric shock. To avoid possible injury or equipment damage:

- Use suitable products: For more information, refer to *7 Recommended hygienic maintenance products on page 269*.
- Do not use high temperatures, except for parts that need sterilization.
- Do not allow liquids to enter the equipment:

  Never allow liquids to enter the internal parts of the equipment.

  Do not apply cleaning sprays or liquids directly to the equipment; always apply such products by using a clean cloth dampened with the spray or liquid.

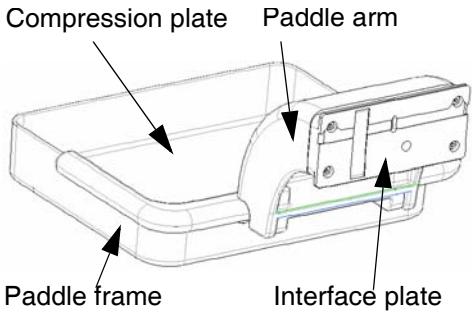
  Take great care to avoid any possibility of liquid running into the equipment, for example around operating buttons and at the edges of moving parts. This is especially important when cleaning keyboards and pointing devices (mouse or trackball).

  If you become aware of liquid entry, disconnect the electrical supply and have the equipment checked by qualified service personnel before returning it to use.
- Do not immerse electrical or metallic components:

  Never immerse equipment parts that enclose electrical components, such as the Bucky/Image Receptor, in any liquid. They must be cleaned with a soft dampened cloth, taking special care not to allow liquids to enter the equipment.

  Never immerse a complete compression paddle in any liquid.

  If necessary, the paddle compression plate and paddle frame may be immersed in suitable disinfectant solution. Never immerse the interface plate; it contains metallic parts which can be damaged.



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4 Cleaning procedures (no contact parts)

- Take careful note of the precautions outlined in section *3 General precautions for hygienic maintenance on page 265*.
- Clean all parts carefully, using a clean microfiber cloth.
  If necessary, moisten the cloth with a cleaning product, defined in Table 6, “Recommended cleaning products (no contact parts),” on page 269.
  Do not allow any drops of cleaning liquid to remain on the surface; extended contact may cause discoloration of the surface.

! Notice:
All parts are sensitive to mechanical damage. While cleaning, avoid all scratches, knocks, etc.

4-1 Cleaning the monitor

- It is particularly important that LCD and CRT monitors used for viewing mammographic images are kept clean and free of fingerprints, dust, etc.

! Notice:
Monitor front panels are extremely sensitive to mechanical damage. While cleaning, take special care to avoid scratches, knocks, etc.

4-2 Cleaning the digital detector

If it is necessary to clean the digital detector when no breast support is inserted, first ensure that the Gantry and Generator power is switched OFF at the X-ray Console. With power applied, there is a risk that short-circuiting the electrical contacts could activate the breast support locking mechanism, which could pinch and damage the operator's fingers.

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5 Disinfection procedures (contact parts)

- Take careful note of the precautions outlined in section *3 General precautions for hygienic maintenance on page 265*.
- Clean, rinse and dry all parts thoroughly, as described in section *5-1 Preparatory Cleaning before disinfection on page 267*, *5-2 Rinsing before disinfection on page 267*, and *5-3 Drying before disinfection on page 267*. Subsequent disinfection may not be effective if the surfaces are not thoroughly cleaned, rinsed and dried.
- Determine the appropriate level of disinfection. Refer to section *5-4 Determine required disinfection level on page 267*.
- Perform the required level of disinfection, *Low*, or *High*. Refer to section *5-5 Disinfection on page 268*.
- After the appropriate contact time, rinse all parts to remove any germicide residue that may remain. Refer to section *5-6 Rinsing after disinfection on page 268*.

5-1 Preparatory Cleaning before disinfection

Before disinfection of patient contact surfaces, they must be thoroughly cleaned, taking care to avoid liquid entry to internal equipment parts:

- Use an appropriate preparatory cleaning product, defined in Table 7, “Recommended disinfection agents (contact parts),” on page 270.
- Follow the instructions supplied with the preparatory cleaning product to clean each surface.
- If additional tools are necessary to reach into corners or to remove material that has dried on the surface, ensure that they are disinfected before and after use.

5-2 Rinsing before disinfection

Rinsing to remove detergent residues is important so that there is no risk of neutralizing the disinfectant.

- For parts where there is a risk of damaging electrical components, use a clean cloth dampened in clean water to remove visible detergent residue.
- For parts where there is no risk of damaging electrical components, rinse the part with directly with water.

5-3 Drying before disinfection

Use a soft clean cloth to dry the surfaces, leaving no traces of liquid. Drying is important to prevent possible dilution of the disinfection agent, which could make the disinfection agent ineffective.

5-4 Determine required disinfection level

The level of disinfection required for a patient contact device depends on the medical state of the patient examined, and medical procedure used. It is the responsibility of the medical team to determine which level of disinfection is required.

- **Low level disinfection - In cases where** there is no risk of cross contamination.
- **High level disinfection - In cases where** there is a risk of cross contamination.

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5-5 Disinfection

- Use an appropriate germicide, defined in Table 7, “Recommended disinfection agents (contact parts),” on page 270. The germicide varies according to whether you are performing low-level or high-level disinfection.
- Follow the instructions supplied with the germicide to disinfect each patient contact surfaces.
- If needed, removable parts not containing electrical or moving mechanical components can be removed and immersed.

CAUTION

Always follow the germicide manufacturer's instructions and precautions for mixing, storage, method of application, contact time, rinsing requirements, protective clothing, shelf life and disposal to help assure effective and safe use of the product.

5-6 Rinsing after disinfection

Further rinsing or wiping with clear water and drying with a soft cloth must be done to remove any germicide residue that may remain. Take care to avoid liquid entry to internal equipment parts.

5-7 Drying after disinfection

Use a soft clean cloth to dry the surfaces, leaving no residue.

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6 Sterilization procedures (acute contact parts)

This procedure only applies to the Stereotaxy accessories. For more information on sterilization, refer to the *Sterilization of metal components used in Stereotaxy procedures* chapter in the *Stereotaxy Operator Manual, 5308817-x-199*.

7 Recommended hygienic maintenance products

Do not use harsh detergents, abrasive cleaners, or aggressive disinfection/sterilization agents. The products summarized in the tables below are tested and known to not damage the Senographe system and its components.

Table 6 Recommended cleaning products (no contact parts)

Component	Recommended cleaning agent
Monitor Footswitches Gantry readout X-ray Console Keyboard Mouse or trackball Digital detector Gantry column covers Gantry arm covers Generator cabinet covers Control Station covers Radiation screen Stereotactic Positioner display	Water or water with ethyl alcohol (up to 96%)

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Table 7 Recommended disinfection agents (contact parts)

Part	Recommended preparatory cleaning agent for disinfection	
Compression paddles 2D Localization paddles Breast supports Stereotactic Positioner All parts of the Lateral & Vertical approach kit Faceshield 2D Cross hair Handles	FDA approved	**CIP 300, manufactured by STERIS Corporation, PO Box 147, St Louis, MO 63166, U.S.A.**
	CE approved	Wip'Anios, manufactured by ANIOS. Laboratoire Anios, Pavé du Moulin, 59260 Lille Hellemmes, France.

Part	Recommended germicide for disinfection		
Faceshield 2D Cross hair Handles	Low-level	FDA approved	**Sani-Cloth HB**, manufactured by Professional Disposables Inc.
		CE approved	**Sani-Cloth Active**, manufactured by Professional Disposables Inc.
Compression paddles Breast supports Stereotactic Positioner	Low-level	FDA approved	**Sani-Cloth HB**, manufactured by Professional Disposables Inc.
		CE approved	**Sani-Cloth Active**, manufactured by Professional Disposables Inc.
	High-level	FDA approved	**CIDEX OPA**, manufactured by Johnson & Johnson Medical, Inc., Arlington, TX, U.S.A.
		CE approved	**Anioxy-Twin**, manufactured by ANIOS. Laboratoire Anios, Pavé du Moulin, 59260 Lille Hellemmes, France.
2D Localization paddles All parts of the Lateral & Vertical approach kit	High-level	FDA approved	**CIDEX OPA**, manufactured by Johnson & Johnson Medical, Inc., Arlington, TX, U.S.A.
		CE approved	**Anioxy-Twin**, manufactured by ANIOS. Laboratoire Anios, Pavé du Moulin, 59260 Lille Hellemmes, France.

Table 8 Recommended sterilization products (acute contact parts)

Refer to the *Sterilization of metal components used in Stereotaxy procedures* chapter in the *Stereotaxy Operator Manual, 5308817-x-199*.

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Chapter 28 Planned Maintenance

1 Introduction

This chapter describes planned maintenance procedures which must be performed regularly to maintain safe and effective operation of the Senographe equipment.

Recommended planned maintenance procedures must be performed as specified by Field Service Representatives, the Radiologic Technologist, and by the Medical Physicist.

2 Planned maintenance performed by the Field Service Representative

Planned Maintenance (PM) must be performed twice a year by a Field Service Representative or similarly qualified and trained personnel.

A complete day is necessary on each occasion. The procedures and their frequency are listed below:

Planned Maintenance: Task Title	Interval (months)
On-site Preliminary:	
Backup Senographe parameters	12
Inspection:	
Preliminary visual inspection of site	6
Visual inspection of equipment	6
Inspect the Radiation Screen	6
Generator/Tube:	
Clean Conditioner Air Filter	6
Check and top-up Conditioner coolant	12
Change Conditioner Coolant	12
Change Generator CPU Lithium Battery	36
Check HV Unit	12
Check Half Value Layer (HVL)	12
Check kVp settings	12
Check mA and mAs settings	12
Generator cover check	6
Gantry:	
Change Gantry CPU Board	120
Check Breast Thickness Measurement	6
Check Gantry functions	12
Check for correct collimation	12
Check and lubricate Gantry mechanisms	12
Gantry cover check	6
Check Manual Compression maximum force.	12

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Planned Maintenance: Task Title	Interval (months)
Check Gantry emergency stop buttons.	12
Control Station - UPS:	
Check UPS function	6
Recalibrate UPS Battery Capacity	12
Change AWS (U20) Mother-board battery (V3 Control Stations only)	12
Control Station cover check	6
Cleaning of Monitor, keyboard, pointing devices, and X-ray Console.	6
Acquisition Image Quality:	
Image Quality Tools Flat Field Test	6
Calibrate Conversion Factor	6
Check Image Acquisition and ACR Score	6
Calibrate mAs Non-Linearity (Automatic)	6
AOP calibration	6
AOP mode and SNR check	6

3 Planned maintenance performed by the Radiologic Technologist

These are simple Quality Control (QC) tests which ensure that the system is operating to its design standards.

Frequency: from daily to twice a year, depending on the task.

Procedures: refer to the Senographe Essential QC manual.

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4 Planned maintenance performed by the Medical Physicist

These are tests performed by the Medical Physicist to ensure that the system provides a high level of mammographic quality.

They fall into two main categories:

- QC tests as specified in the QC Manual, Refer to section *4-1 QC tests on page 273*.
- A test to ensure the correct operation of flexible compression paddles. Refer to section *4-2 Test for flexible paddle deflection in compression on page 273*.

4-1 QC tests

Frequency: annually.

Procedures: refer to the Senographe Essential QC Manual.

4-2 Test for flexible paddle deflection in compression

4-2-1 Objective

To ensure that the flexible compression paddle is capable of applying effective compression to the breast.

4-2-2 Frequency

This test should be performed annually or when a loss in performance is suspected.

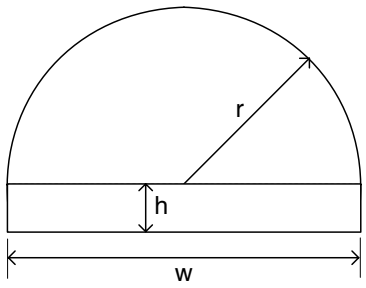
4-2-3 Test object

The test object is based on estimates of the average size of a compressed breast.[1,2] Refer to GE Healthcare MQSA Compliance Guide 2233373-100 for information on the calculations used to determine its dimensions.

The suggested test object is shown here:

- The basic shape is a right circular semi-cylinder extended by a rectangular box.
- Its dimensions are:

Flexible sliding 19 x 23 paddle	Flexible 24 x 31 paddle
r = 9 cm	r = 11 cm
h = 1 cm	h = 3 cm
w = 18 cm	w = 22 cm



See below for information on the thickness and suggested material of the test object.

- The thickness of the test object is not critical, but values in the range of 3 to 5 cm are recommended. Since the purpose of the test objects is to evaluate the parallelism between the compression paddle and the breast support surface, the parallelism of the upper and lower surfaces of the test objects is critical. Consistency of the thickness within ± 0.5 mm is recommended.
- It is intended that the test object be made of a compressible, foam material. One foam material that has been used in a similar application is type T-200, Minicel foam produced by the Voltek division of Sekisui America Corporation. This foam has been selected for use in the “Tissue Mimicking Compression Test Tool,” Model BC200, sold by Standard Imaging, Middleton, WI, in part because it behaves similarly to breast tissue during compression.[3]

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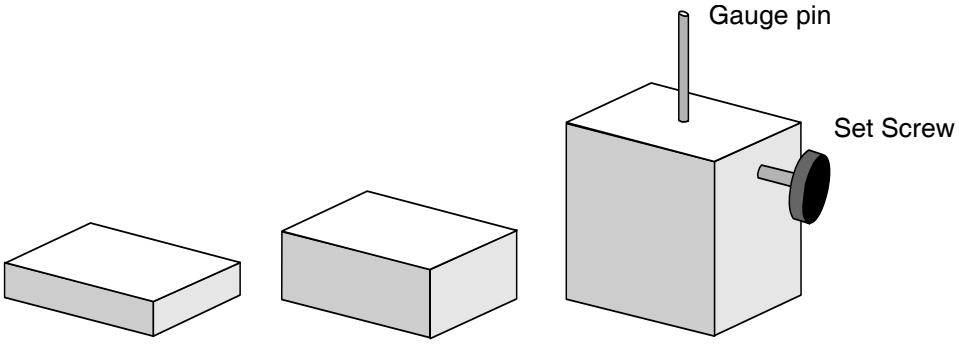
4-2-4 Telescoping gauge and gauge blocks

- A telescoping gauge can be used to locate the corner of the compression paddle that most closely approaches the breast support surface after compression is applied to the test object. The telescoping gauge is then stacked on an appropriate thickness of gauge blocks to test the distance between each of the other three corners of the paddle and the support surface and to determine if the deflection of the paddle meets the specification. This gauge kit provides a “go-no go” test of the deflection.
- A minimum of one 10 ± 0.05 mm gauge block is needed to perform the test on a paddle that is intended to remain flat and parallel to the breast support table [21 CFR 900.12(b)(8)(B)]. Additional blocks of appropriate thicknesses (±0.05 mm) must be included for testing of paddles such as the flexible paddle which are not intended to remain flat and parallel within the 1.0 cm deflection limit [21 CFR 900.12(b)(8)(C)], or to extend the telescoping gauge in the event that the gauge pin does not contact the compression paddle with the pin fully extended from the gauge.



4-2-5 Support plate

- Another element of the test set-up is a support plate. This is based on the observation that the breast support surface as well as the compression paddle will deflect during the compression. The intent is to support the test object on a surface that is considerably more rigid than the compression paddle so that the deflection of the paddle is measured and not the deflection of the base on which it rests. The support plate should be large enough to completely cover the image receptor support device. A sheet of acrylic with dimensions of about 25 cm x 30 cm x 1.9 cm thick (10 in x 12 in x ¾ in) is suggested. A 10 in x 12 in x ¼-inch aluminum sheet could also be used for this purpose.

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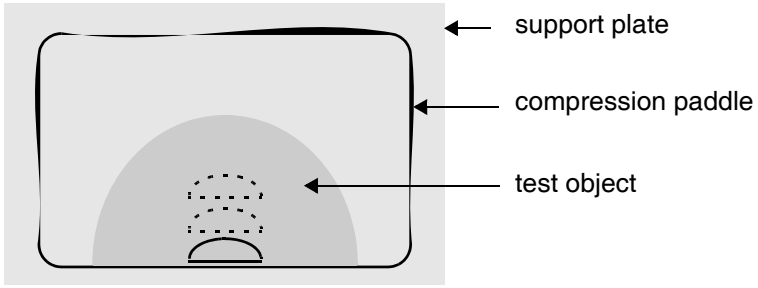
4-2-6 Procedure

1. Place the support plate directly on the image receptor support device so as to completely cover the breast support surface.

   Note:

   The support plate must be parallel to the breast support surface of the Bucky. Ensure that the support plate is not resting on any corner reinforcements or other raised edges on the top of the Bucky. If the support plate is placed on top of the force scale, ensure that the top surface of the support plate remains parallel to the breast support surface of the Bucky. The distance between the breast support surface of the Bucky and the top surface of the support plate should be constant within 1 mm around the periphery of the Bucky.

2. Place the test object on the support plate as shown below with the cylindrical axis of the test object aligned along the X-ray beam. Align the straight edge of the test object with the chest wall edge of the compression paddle. Center the test object left-to-right.
3. For a flexible sliding paddle, first ensure that the paddle is in its centered position.

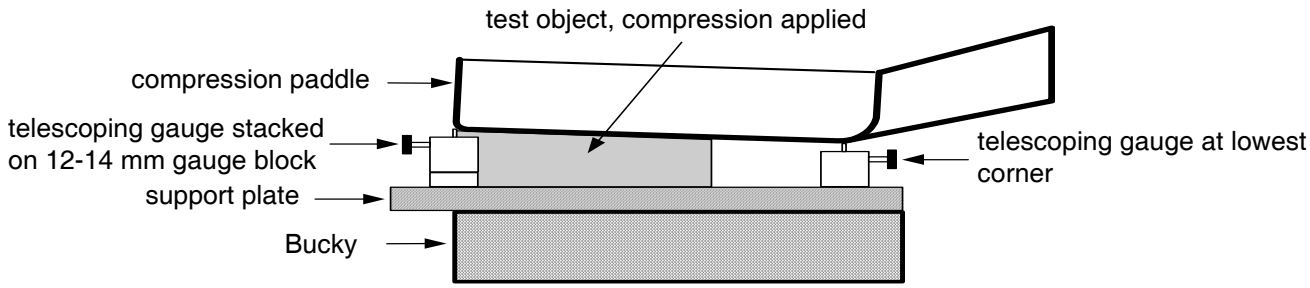


4. Apply a compression force of 11 to 12 daN (25 to 27 lb.).
5. Use the telescoping gauge to locate the lowest corner of the compression paddle (closest to the support plate) as shown in the illustration below. Use the set screw on the telescoping gauge to lock the gauge pin in position at the measured distance.

   Note:

   If the pin on the telescoping gauge is fully extended yet the gauge is shorter than the smallest distance between the support plate and the compression paddle, use the gauge blocks to extend the reach of the telescoping gauge.

6. Stack the telescoping gauge on a thickness of gauge blocks to test for the12 mm to 14 mm deflection limit specified for the flexible paddle. Test each corner of the compression paddle to determine if the combination of the telescoping gauge plus the gauge block(s) can fit between the compression paddle and the support plate.



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4-2-7 Evaluation

For the flexible compression paddle, which is not intended to be flat and parallel to the breast support table during compression, the deflection must be within the following values:

For a flexible sliding 19 x 23 paddle:

- Minimum: 12 mm
- Maximum: 14 mm

For a flexible 24 x 31 paddle:

- Minimum: 17 mm
- Maximum: 19 mm

4-2-8 Corrective action

- If the deflection exceeds the specified limits, the paddle should be replaced.

4-2-9 References

1. I. Fife, "*The physical dimensions of the compressed breast*," *British Jnl. of Radiology*, 64, 73, 1991.
2. *Handbook of Glandular Tissue Doses in Mammography*, HHS Pub. FDA 85-8239, U. S. Department of Health and Human Services, Food and Drug Administration, Rockville, MD, March, 1985.
3. Keith Nelson, Standard Imaging, Middleton, WI, private communication.

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Chapter 29 Specifications

1 Technical specifications

1-1 Scope

This chapter concerns only specifications linked to use by the Operator of the system once it is installed and operational. For more detailed specifications regarding the pre-installation, transportation, storage, installation and maintenance of your system, please refer to the corresponding Service Publications.

1-2 Electrical specification

Mode of operation: Continuous operation with intermittent loading.

1-2-1 Line voltage specifications

- Single-phase input voltage (phase-neutral or phase-phase):
  - 200/208/220/240 V (± 10%)
- Line frequency specification: 50 or 60 Hz (± 1 Hz)
- Classification:
  - Type of protection against electric shock: CLASS 1.
  - Degree of protection against electric shock: TYPE B.
- Maximum line current of the system: 42 A at 180 VAC, based on maximum input voltage (30 kV) and output current (100 mA) of the tube housing assembly.
  The maximum line current corresponds to the use of the technique factors 30 kV, Mo track, large focal spot and 100 mAs or more.

1-2-2 kVA load characteristics

- Maximum instantaneous power (during exposures, up to 6 seconds) 9 kVA,
- Power factor: 0.6.

1-2-3 Input impedance

The apparent resistance of the mains supply R_L must be less than that which would cause a voltage drop of 6% at the maximum power load of 9 kVA. See the table below for relevant values:

Nominal voltage (V ac)	200	208	220	240
Maximum impedance R_L (ohms)	0.28	0.30	0.34	0.40

1-2-4 Generator output (excluding tube)

- 22 through 49 kV,
- 20 through 130 mA.

1-2-5 Duty cycle

The generator is always limited by the tube: the generator can supply a maximum of 100 W to the tube.

- For an exposure under 40 kV, the system is limited by the tube mean current (2.5 mA).
  Duty cycle is 30 kV/150 mAs exposure each minute.
- For an exposure over 40 kV, the system is limited by the generator mean power (100 W).
  Duty cycle is 48 kV/125 mAs exposure each minute.

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1-2-6 Line conditioner resonance frequency

- 20 kHz approx.

1-2-7 Generator power (excluding tube)

- 5 kW maximum.

1-3 Maximum tolerance of displayed constants

kV and mAs:

- kV: ± 5%
- mAs: ± (7.6% +1.1 mAs)

Measurement Conditions:

- kVp

  Connect an HV voltage divider (Machlett Dynalizer IIIA; ratio 10 kV/1 V) in series with the x-ray tube and measure the voltage with a multimeter (Fluke 45 or 87).
- mAs

  Connect an HV voltage divider (Machlett Dynalizer IIIA; ratio 10 kV/1 V) in series with the x-ray tube. Connect a waveform analyzer (Tektronix 7854) to the output of the divider; the analyzer receives a signal proportional to the voltage applied to the tube. The mAs values are given by:

$$mAs = \int_{T1}^{T2} i\,dt$$

  Where T1 is the time at which the high voltage reaches 75% of its maximum value, and T2 is the time at which the high voltage returns to 75% of the maximum value.

Compression force and breast thickness:

- Compression Force: ± 10 newton
- Breast Thickness: ± 10 mm

1-4 AWS storage

Total internal disk system capacity: 250 Gbytes.

Allocated for image storage: 194 Gbytes (corresponding to approximately 6500 acquisitions).

1-5 Digital Detector FOV

Field of View (FOV) of the Digital Detector: 24 cm x 30.7 cm.

1-6 Main characteristics of the grid

- Linear type
- Number of lines: 36 line pairs/cm
- Grid ratio: R = 5 : 1
- Focalizing distance: F0 = 65cm

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2 Radiation and filter information

2-1 Radiation reference axis

Conforming to standard mammography practice, the radiation reference axis is directed at the chest wall edge of the digital detector; radiation is shielded so that there is no radiation directed behind the chest wall.

2-2 Leakage technique factors

With respect to radiation regulation, the tube housing and the Collimator are in compliance with DHHS 21 CFR1020:
Leakage technique factors applicable: 49 kV at 2 mA.

2-3 Nominal X-ray tube voltages and currents

- Nominal X-ray tube voltage and the highest X-ray tube current available at that voltage:
  49 kV; 61.2 mA
- Highest X-ray tube current and the highest X-ray tube voltage available at that current:
  100 mA; 30 kV
- Corresponding combination of X-ray tube voltage and X-ray tube current which results in the highest electrical output power (3 kW):
  30 kV; 100 mA or 49 kV; 61.2 mA
- Nominal electric power given as the highest constant electric power (in kW) which the X-ray generator can deliver, for a loading time of 0.1 s at an X-ray tube voltage of 30 kV:
  100 mA x 30 kV = 3 kW

2-4 Irradiation in AOP mode

- Nominal shortest irradiation time in AOP mode: 40 ms.
- Range of X-ray tube voltage during irradiation in AOP mode: 24 through 35 kVp.
- Range of X-ray tube current during irradiation in AOP mode: 30 through 100 mA.

2-5 Filters and anode tracks

Maximum current for each track/focal spot configuration:

	Track	
Focal spot	**Mo**	**Rh**
Large	100 mA max.	62 mA max.
Small	40 mA max.	35 mA max.

The minimum filtration permanently installed in the useful beam of the X-ray tube is 0.008 mm aluminum equivalent (8 µm aluminum equivalent) at 30 kV corresponding to the minimum thickness of beryllium of the X-ray tube output window.

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The switched filters are installed on a disk driven by a stepping motor which moves from one filter to the other. Two different filters are supplied:

- Molybdenum: 0.03 mm,
- Rhodium: 0.025 mm,

Note:

The system electronics control the filters according to Operator requirements in manual mode, or to software requirements in AOP mode

TARGET	**VOLTAGE** (kV)	**FILTER**	**EQUIVALENCE** (half-value layer)
Molybdenum	30	0.03 Mo	0.3 mm Al minimum
Molybdenum	30	0.025 Rh	0.35 mm Al minimum
Rhodium	30	0.025 Rh	0.4 mm Al minimum

2-6 Attenuation equivalence

Attenuation equivalence for components in the X-ray beam (in accordance with FDA HHS 21 CFR, § 1020.30; measurements made at a potential of 100 kVp, using an X-ray beam with an HVL of 2.7 mm of aluminum):

Component	**Al equivalence (mm)**
Magnification stand (1.5 and 1.8)	less than 0.35
Image receptor support	less than 0.2
Bucky cover	less than 0.2
Stereotix positioner	less than 0.3

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3 Environmental Requirements

3-1 Atmospheric Pressure Limits

Atmospheric pressure		Altitude (from sea level)	
Min.	Max.	Min.	Max.
700 hPa	1060 hPa	0 m	3000 m
		0 ft	9840 ft

3-2 Operating Requirements - temperature and humidity

Relative humidity (non-condensing)		Temperature	
Min.	Max.	Min.	Max.
10%	80%	15°C	35°C
		59°F	95°F

3-2-1 Air conditioning

- Air conditioning must be provided where necessary to ensure that no part of the equipment (including the generator cabinet) operates in an ambient temperature exceeding 35°C *(95°F)*.
- For patient comfort, ambient temperatures of 23°C ± 3°C *(73°F ± 5°F)* are recommended.

3-3 Short Term Shutdown Requirements - temperature and humidity

3-3-1 Shutdown with Conditioner on

During evenings and weekends some Operators shutdown the Senographe system via the Control Station; in that case the Conditioner remains switched on, and the environment must be within the following limits.

Relative humidity (non-condensing)		Temperature	
Min.	Max.	Min.	Max.
10%	80%	15°C	35°C
		59°F	95°F

3-3-2 Shutdown with Conditioner off

During evenings and weekends some Operators shutdown the Senographe system via the circuit breaker on the wall; in that case the Conditioner is switched off, and the environment must be within the following limits.

Relative humidity (non-condensing)		Temperature	
Min.	Max.	Min.	Max.
5%	95%	10°C	50°C
		50°F	122°F

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3-3-3 Air conditioning

Air conditioning must be provided where necessary to ensure that no part of the equipment (including the generator cabinet) exists in an ambient temperature exceeding 35°C *(95°F)* or below 15°C *(59°F)*.

4 Ambient light level

Senographe Essential monitors are adjusted for use in light levels up to 50 lux.

5 Tube information

Tube Cooling Curves and other tube-specific technical parameters can be found in the Tube Product Data document, part no. 2281990-100, included with the system documentation.

6 Dimensions and weights

Component	Dimensions in mm *(inches)*			Weight kg *(lbs)*
	Depth	Width	Height	
Gantry	1273 *(50.1)*	min. 616 *(24.25)* max. 1842 *(72.5)*	min. 1930 *(76)* max. 2626 *(103.4)*	450 *(990)*
Generator cabinet	640 *(25.2)*	436 *(17.2)*	1330 *(52.4)*	160 *(352)*
Control station with radiation shield, AWS LCD monitor, and X-ray Console	400 *(15.75)*	710 *(28)*	2225 *(87.6)*	145 *(320)*

7 Intellectual Property rights

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Revision History of this publication

See section *4 Revision history on page 14* of Chapter 1 *Publication presentation*.

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